Insure VICTORY .... Buy Bonds for War .... Push Plans for Peace

Contractors and Engineers Monthly

Vol. 41, No. 9 SEPTEMBER, 1944 $2 a Year, 20 Cents a Copy

Be Sure to Read

Airports Here and Abroad

Airport construction to meet expanded Army requirements, in both this country and Great Britain, is described in this issue. The project to make the Newark, N. J., Airport, well-known civil airport of pre-war days, one of the largest military airfields in the east involved an extensive stabilized fill, the installation of additional drainage, and both bituminous and concrete paving. Some of the problems of the British airfield-construction program and how they were met are discussed by a British engineer. See pages 1 and 43.

Two Types of Siphons

Contractors will find of interest descriptions of the construction of two types of siphons. For one, a 544-foot inverted concrete siphon to carry the Madera Canal in California under a creek, an ingenious sectional form was used. This structure was part of the contract for an 11-mile section of the canal which included both rock and earth excavation and thirty-two other concrete structures. The second type of siphon consists of double cast-iron pipes to carry the Bridgeport, Conn., sewer line across narrow channels.

See pages 2 and 37.

Bridges for War and Peace

The peacetime applications of wartime necessities have already become evident in many fields. One of interest and importance to highway engineers is the standardization of design and fabrication of structural steel for the various river crossings on the Alaska Highway, which made for speed and economy in construction and which should be equally applicable in the state and county highway field. Although the Bailey Bridge, developed for use by the Royal Engineers and now adopted by the U. S. Engineer Corps, was intended primarily for wartime service, its inventor suggests that it too may have its peacetime uses. See pages 11 and 21.

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Newark, N. J., Airport Is Greatly Enlarged For Army Air Forces

Extensive Stabilized Fill, Drainage System on Piles, Three Asphalt Runways Now Over Mile in Length

By WILLIAM H. QUIRK,
Eastern Field Editor

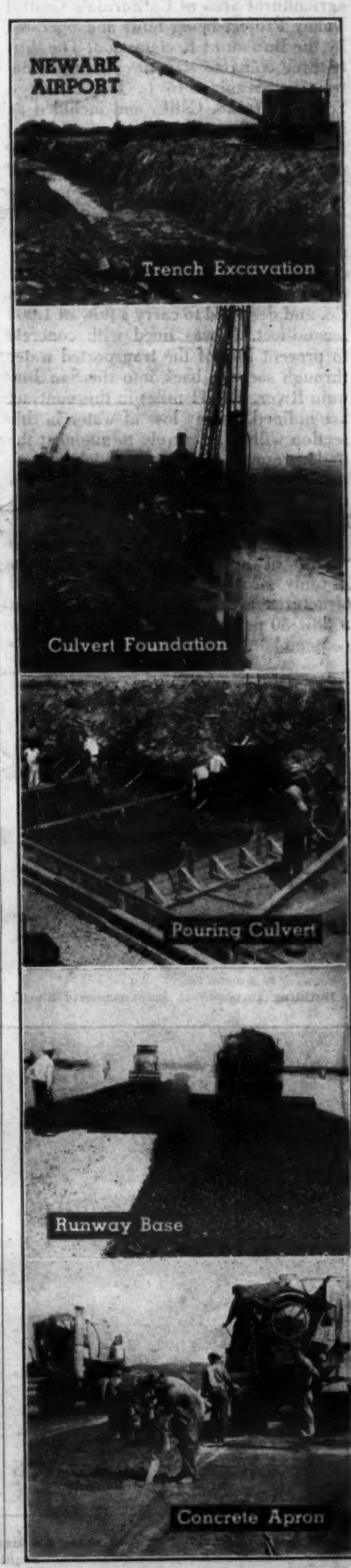
(*Photo on page 88*)

✦ THE civil airport of Newark, New Jersey, taken over by the Army at the onset of the war, was recently enlarged so that it is now one of the greatest military airfields in the east. From a former uniform length of 4,000 feet, the three major runways have been lengthened to 5,950, 7,100 and 7,900 feet. This extension of runways, including additional taxiways, hard-standings and warming-up aprons, involved large borrow and fill operations, flexible and concrete paving, and an extension of the existing drainage system, for a total cost of $6,000,000. Hard-standing is a unique Army term for a circular paved area of varying diameter, stemming from the taxiways, on which planes are parked.

Nature furnished a level site for this airport on the marshlands along Newark Bay in Essex County, but she used soft yielding material which made it unsuitable for the base stability required. Ground water in the marshlands is at plus 1 foot mean sea level. Borings passed through layers of silt, decaying vegetable matter and red clay until shale rock was struck at an average depth of minus 50 feet mean sea level. One boring even showed a mud depth of 140 feet. Nearly 2,000,000 cubic yards of fill was needed, over half of which was required to be of selected borrow, that is, a silty gravelly sand, a fairly porous material which would absorb surface water.

Two excellent borrow pits were obtained in the towns of Union and Kenilworth in adjoining Union County about 9 miles from the job. Two Bucyrus-Erie power shovels with 2½-yard buckets worked these pits and were assisted by nine other shovels with buckets of from 1¼ to 2-yard capacity. These smaller shovels were moved to the job site as occasion required. Four Inter-

(*Continued on page 14*)



Southern State Has Snow Troubles Also

Altitude, Not Latitude, in New Mexico Brings Snow and Ice Problems; Planning for Post-War Work Progresses

✦ ALTHOUGH New Mexico considers herself a southern state and the average temperature is warm and enjoyable, there are sections where the altitude brings snow storms, not heavy nor of long duration, but in the winter of 1943-44 the unusual number and severity of these storms presented a serious problem to a state which ordinarily has no need for an elaborate organization and equipment for snow removal.

The state highway system consists of 3,800 miles of bituminous-surfaced roads, 1,200 miles of gravel surface, 2,900 miles which are drained and graded, and only 69 miles of concrete pavement. In addition to this 7,969 miles which are kept open regardless of snow conditions, another 2,000 miles in the county systems often receive assistance from the state maintenance forces when an unusually severe snowfall taxes the abilities and equipment of the county crews beyond their capacities. This county aid is not needed yearly but is required about once in each five years.

Because the snowfall is ordinarily light and seldom occurs over large areas simultaneously, it is not economical to provide snow-removal equipment which does not have additional uses, so most snow plowing is done by Caterpillar Nos. 11 and 12 motor graders, temporarily equipped with snow wings, which are used for routine maintenance throughout the remainder of the year.

Wartime shortage of parts, particularly those made of high-strength alloy steel such as crankshafts and axles for heavy equipment, has imposed additional problems, as has the loss of trained mechanics and operators to the armed forces and war industries. In one district at a critical time last winter, twelve of the twenty-one available machines were idle due to lack of operators. One of the most troublesome spots in the state is the intersection of U. S. Routes 66 and 285 in Torrance County, about 60 miles east of Albuquerque. Carrying a heavy volume of traffic on both highways, this intersection is at an elevation of 7,061 feet, in sparsely populated open country

(*Continued on page 52*)

Siphon Form Work Features Canal Job

Contract for 11-Mile Section of Madera Canal In Calif. Includes Heavy Grading, Concrete Work

By FRANK B. SARLES,
Western Field Editor

(Photos on page 88)

✦ DURING 1943 and 1944, Larsen Bros. and Harms Bros. of Sacramento, Calif., constructed an 11-mile section of the Madera Canal to transport a part of the water impounded by Friant Dam, near Fresno, Calif., to the productive agricultural area of California's Central Valley Project being built and operated by the Bureau of Reclamation. The thirty-three concrete structures in this contract were sublet to L. H. Hansen & Sons of Fresno, Calif., and included an inverted siphon 544 feet long and 12.5 feet inside diameter to carry the canal under Hildreth Creek. The sectional form used in its construction is particularly worthy of note.

The portion of the Madera Canal constructed under this contract lies immediately below an 8-mile section completed in 1942 by the Utah Construction Co. and designed to carry a flow of 1,000 second-feet. It was lined with concrete to prevent loss of the transported water through seepage back into the San Joaquin River. The 11 miles in this contract are unlined, as any loss of water in this section will serve merely to augment the underground water supply which is used, through wells, for the present irrigation of the area served. Since 175 second-feet is to be diverted near the end of the section previously constructed, this 11-mile portion of the canal will have a capacity of only 825 second-feet. However, all structures are large enough to permit a flow 50 per cent in excess of that now contemplated, should it later become necessary to increase the flow in the canal. The unlined section, with a bottom width of 20 feet and side slopes of 1½ to 1, has a grade of 0.015 per cent or approximately 0.79 foot per mile and a designed water depth of 9.16 feet. It follows a winding alignment running generally in a northwesterly direction from Friant Dam.

Excavation

Sections of the canal necessitating the construction of impervious embankments were built in advance of the general excavation. Four 12-yard LeTourneau scrapers pulled by Caterpillar D8 tractors, two D8's with LeTourneau bulldozers, and a Caterpillar diesel-powered motor grader were used. A smaller Caterpillar tractor pulled the sheepsfoot roller used to compact the core bank built to a minimum top width of 8 feet and compacted in 6-inch layers. Selected material was used for these impervious core banks, and was obtained from borrow pits if the nearby canal excavation did not provide suitable material.

Since the contract included considerable solid rock excavation, the contractor organized an exploratory drilling crew with a wagon drill and small Schramm compressor to drill test holes each 100 feet well in advance of the excavating schedule. Where rock was encountered,

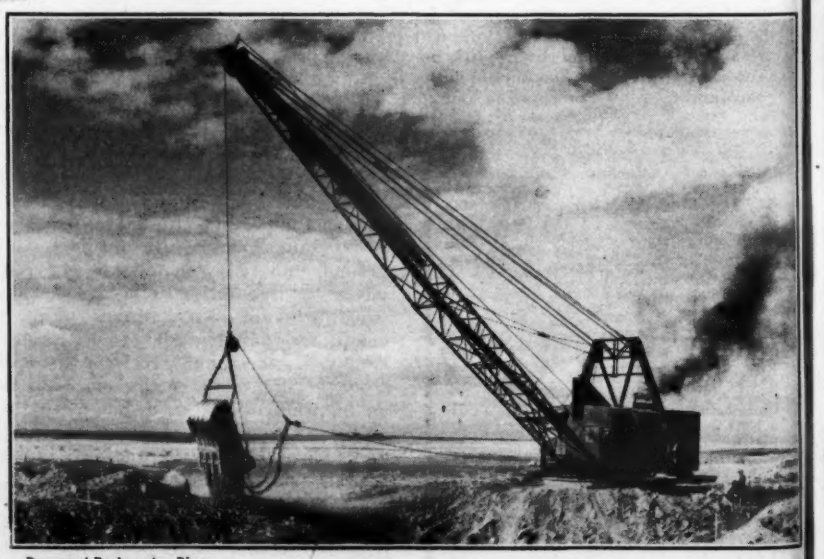
(Continued on page 28)

Bureau of Reclamation Photo
The siphon forms and reinforcing were assembled in 25-foot sections.

Bureau of Reclamation Photo
One section of siphon form being cured, while the forms and reinforcing are assembled for an adjacent section.

Bureau of Reclamation Photo
Building impervious embankments ahead of excavation on the Madera Canal, Calif.

Bureau of Reclamation Photo
Wagon drills working in rock along the line of the Madera Canal where blasting was required.



Bureau of Reclamation Photo
This Bucyrus-Monighan with a 100-foot boom and 5-yard dragline bucket did most of the excavation on the Larsen Bros. and Harms Bros. section of the Madera Canal.

Post-War Plans In New Hampshire

State Will Continue Its Policy of Modernization And Improvement of Roads; Interregional System

By FREDERIC E. EVERETT, Commissioner, New Hampshire State Highway Department

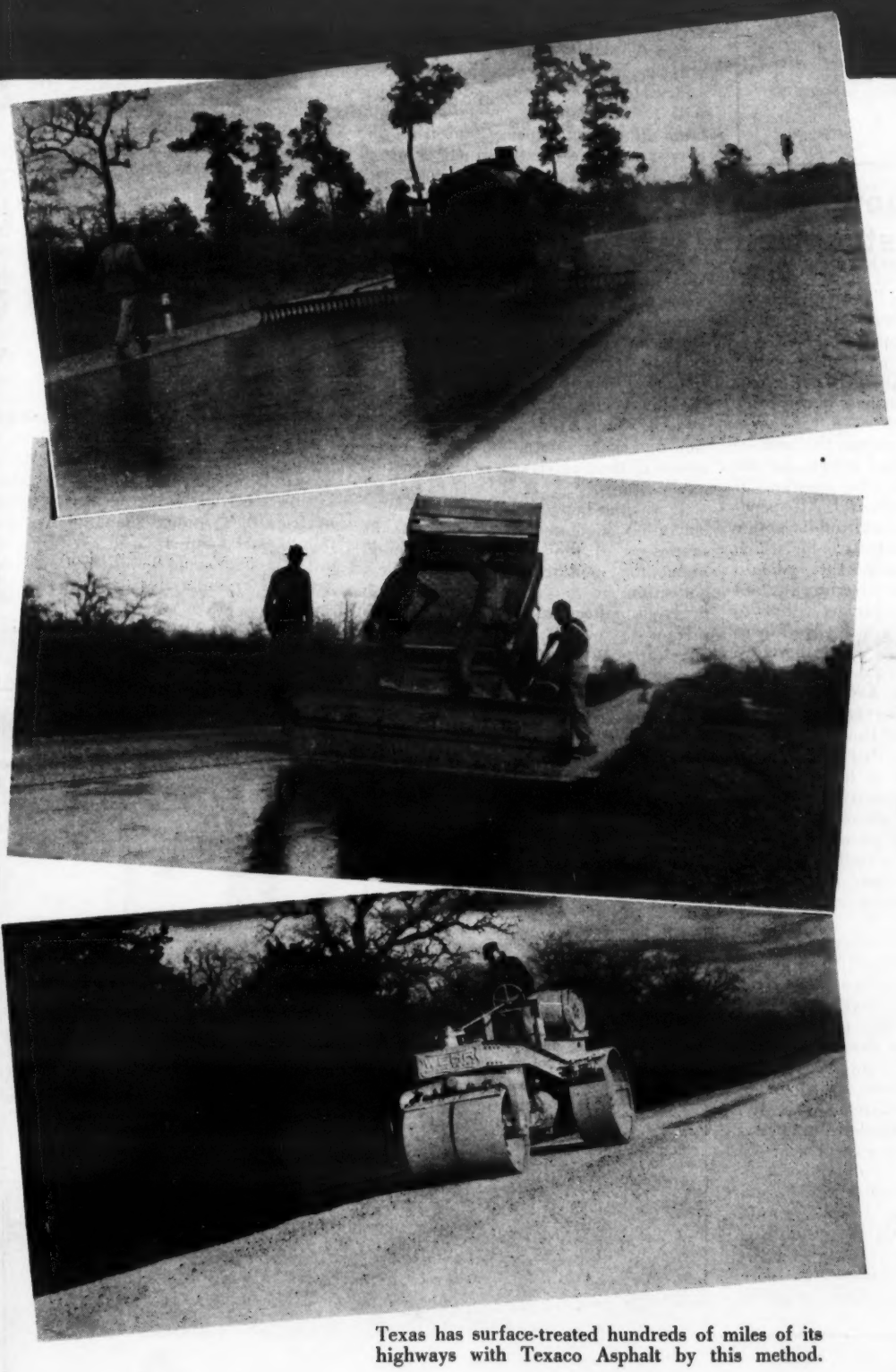
✦ POST-WAR highway construction in New Hampshire will adhere closely to the policy which existed within the state prior to the war, with the one major exception of the anticipated construction on the proposed National Interregional Highway System. This does not mean that the volume of construction will remain the same as before the war, for there is a great need to compensate for work which has been postponed. Sections of highway that normally would have been built during the war period are now in urgent need of immediate construction. Work that should have been programmed for construction two years ago also requires attention now.

Post-War Program

Prior to the war, the New Hampshire highway construction program consisted principally of rebuilding sections of the state's primary system that were below the standards of safe modern design as regards alignment and grade, and of replacing sections in which pavements were worn out, thereby resulting in excessive maintenance costs. It is our intention to carry on the same type of

(Concluded on page 86)

Road mats as Texas builds them with Texaco



Texas has surface-treated hundreds of miles of its highways with Texaco Asphalt by this method.

MILE AFTER MILE of the Texas State Highway System owes its smooth, easy-riding qualities to a low-cost Texaco Asphalt mat.

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The Ruml-Sonne Post-War Money Plan And Its Effect on Public Construction

There is good authority in Washington for more than a mere hope that construction for civilian use will move sharply upward by the middle of 1945, if the German phase of our global war ends in 1944. This optimistic outlook is predicated on a Federal administration that will release materials, finances and other controls sufficiently to permit private enterprise to enter into active construction of highway, irrigation, flood-control, and navigation projects, as well as home building through group housing and more expensive private homes.

A very significant statement on fiscal and monetary policy, including taxes, and the impact of Federal policies on construction has recently been made in a report to the National Planning Association by two outstanding members of its Business Committee, Beardsley Ruml and H. Christian Sonne. The report assumes essential employment as 55,000,000 people working 40 hours a week in 194X. This would produce about $140,000,000,000 of money income payments to individuals at the price level of 1943.

The authors assert that the financial operations of the national government must "complement and supplement the activities of private enterprise when needed to maintain an effective demand adequate to sustain high levels of employment at or about prevailing price levels". This means Federal budget deficits at times of unemployment, but only in proportion to the emergency. It does not contemplate permanent budget deficits as a necessary part of our national economy, but looks forward to possible periods of over-expansion of private business activity which would be checked by public-debt retirement.

The report continues, "Given the wide area which is generally agreed to be suitable for public activities through public agencies at all levels of government, the stimulus to purchasing power when needed may come in part through reduction of taxation. Such reduction in taxes should be made where it will do the most good in creating demand and in encouraging private enterprise and investment.

"Public works, including conservation, have been suggested as means of leveling out the business cycle. We must not, however, expect too much from a public works program as a means of supporting high employment. The most we can expect, and this is no small gain, is that public works can and should be planned and undertaken in such a way as to even out the activities of the construction industry itself, thereby providing a reasonable level of construction over long periods of time."

As integral parts of their proposed fiscal and monetary policy, Messrs. Ruml and Sonne recommend the abolition of Federal income taxes on corporations, with only a small franchise tax of 5 per cent which represents "the value of doing business in corporate form".

The Federal government, the authors stress, should not spend merely for the sake of spending or the creation of purchasing power in general. All spending should express agreed public policy with respect to the objective for which the expenditure is made. There should be higher efficiency in government, "not to help balance the budget", but to permit getting the same government services at lower costs, and therefore to permit a lower tax rate.

Spending on such items as public construction, and conservation, and Federal lending should be timed to periods of low employment so that optional disbursements will tend to hasten expansion to high employment. The Ruml-Sonne memorandum stresses, however, that "the acceleration of such optional items should not be permitted to raise the level of regular budget disbursements and should disappear with high employment".

For at least twenty years the public has been led to believe that, through the timing of public construction, the business cycle might be leveled off. This is unfortunate, according to Ruml and Sonne. They feel that the construction industry cannot and should not be manipulated as the primary factor in maintaining high employment generally. The task is too great; the administrative problems insoluble except with objectionable central administrative control; and in stabilizing the whole economy, the construction industry would be itself subject to extreme instability, says the report.

Ruml and Sonne choose a more limited objective for the timing of public works, namely to stabilize the construction industry itself throughout the year and over the years at a level consistent with the construction requirements of American life. Even this objective will require cooperation from all elements of the construction industry, and a certain amount of legislation and public supervision.

The gains resulting from this policy would be considerable and include:

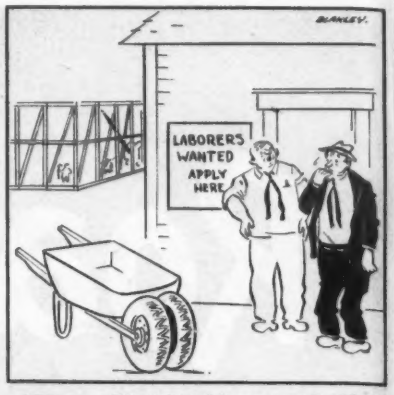
1. For fiscal policy, timed disbursements for public construction to stabilize the construction industry will regularize one of the most fluctuating elements in the whole economic picture, public construction being increased proportionately as private construction decreases, and vice versa.
2. A stable construction industry will benefit all elements of industry.
3. Higher efficiency and lower costs will result from the reduction of idle labor and plant expense and from the correction of restrictive practices which have grown up in the construction industry.

Such a public works policy requires a study by the industry to see what changes should be made to justify the very large public expenditures involved over the years of this program. The government must get its fair money's worth in public works, and it can get it only from an efficient construction industry. Private citizens will benefit in the lower cost of private construction as well. Such a policy requires cooperation of Federal, state, and local governments in their programs of construction expenditures.

It was the impact of Mr. Ruml's pay-as-you-go income tax plan upon the taxpayers of the nation that brought about the modification of income-tax collection by Congress which, though tardy, is collecting at the source much income tax which we all know would have failed to reach the Federal treasury through individual oversight or intent. The new well-integrated policies outlined and discussed in the Ruml-Sonne report should be given serious consideration by the Congress to stabilize Federal finances and business during the critical years following the inevitable immediate post-war boom. Our government is a party to a program of international reforms to stabilize monetary relations as between nations, but little has been done to stabilize our internal fiscal affairs to strengthen the tax income for the payment of our internal indebtedness and to aid business to insure high employment.

The National Planning Association, while not yet endorsing every detail of the Ruml-Sonne report, is urging individual and collective discussion of the report to enable it to strengthen and further elucidate the principles broached, as well as modify them where necessary.

Copies of the report "Fiscal and Monetary Policy" may be secured by readers of CONTRACTORS AND ENGINEERS MONTHLY from the National Planning Association, 800 21st Street, N. W., Washington 6, D. C., at 25 cents for single copies and generous discounts for quantities of ten or more.



"Why no, it's not real heavy work. Why do you ask?"

A NEW CAA AIRPORT

Scenes during the construction of the Natchez, Miss., CAA Airport which will have three runways, each 5,000 feet long and 150 feet wide plus shoulders. The job involved 2,340,000 cubic yards of dirt moving, for which a large fleet of Caterpillar D8, D7 and DW10 tractors with scrapers and motor graders was used. The group in the lower right-hand photo includes O. D. Lee, Mississippi Tractor & Equipment Co.; K. F. Park, Caterpillar Tractor Co.; Larry Cain, General Superintendent, and W. Anderson, Assistant Superintendent, D. W. Winkelman Co., Inc., Syracuse, N. Y., contractor for the project.

Figure It Out

SEAMAN MIXER REDUCES ROAD-MIX COSTS OVER 60%

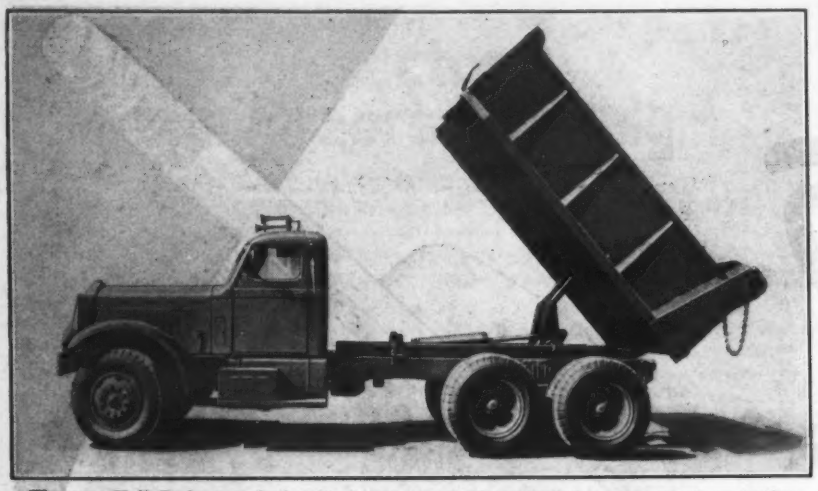
Daily output of road mixed materials is greatly increased or the same quantity is finished sooner with Seaman Mixer — and consequently costs per yard are proportionately reduced.

For example — in bitumen airfield runway or highway construction, — spread the material flat, then the binder is applied. Follow the distributor immediately with a motor grader windrowing, followed by a Seaman Mixer on the windrow. After one pass the material is flattened and another application of bitumen applied and again windrowed and mixed. Successive passes are made in this manner until the required bitumen is applied. Because the Seaman Mixer produces a quicker and more thorough mix, — markedly less binder will be required to bring the material up to proper color. A train of equipment should be formed with a grader ahead, turning the aggregate into a windrow followed by a Seaman Mixer. Another grader should follow the Seaman with a second Seaman, at its heels. In such a sequence of operations, contractors constantly report that, not only have the number of graders required been reduced, but mixing has been better accomplished often in less than 1/3 the time.

More popular than ever! The 1944 edition of Soil Stabilization Methods, a compilation of up to the minute practices in highway and runway stabilization. Write for Bulletin E-24

SEAMAN MOTORS

EVERY ROAD-MIX JOB NEEDS A SEAMAN



The new Heil Twin-Arm hydraulic hoists are easily mounted on any truck or trailer and will lift loads up to 24 tons to a 50-degree angle.

New Twin-Arm Hoists For All Dump Trucks

A new line of hydraulic hoists suitable for all makes of trucks and trailers and all styles of dump bodies has been announced by The Heil Co., 3000 W. Montana St., Milwaukee 1, Wis., as another new development to come out of the war. Formerly there was a vast assortment of styles and sizes of hoists for specialized purposes. The new Heil Twin-Arm hydraulic hoists have been greatly simplified and save over 300 pounds of dead weight on a 1,800-pound unit, according to the manufacturer. They are completely fabricated and welded, require no heavy castings, eliminate many rollers, cams and gears, and permit operators to carry a greater payload on each trip.

The hoists are capable of lifting loads of 24 tons to a 50-degree dumping angle in 10 to 15 seconds. The operation is reported to be smooth and noiseless and the body can be stopped and held at any angle without undue strain on the hoist mechanism. Loads may be dumped readily even when the truck chassis frame is twisted because of uneven ground.

Other helpful features in the standardization of this new Twin-Arm hoist to a few models for all purposes are that it will eliminate the necessity for large dealer inventory, simplify mounting procedure, speed up delivery, and lower prices. Complete information on these new hoists for dump trucks may be secured direct from Heil.

New Steel Derricks

Two new steel derricks, in 4 and 6-ton models, are being made by the J. E. Ingram Co., 1146 W. Laurel St., San Antonio 6, Texas. Although at present the entire production of these derricks is going to the armed forces, units will be available for civilian use as soon as military requirements permit, and the company anticipates a large post-war demand.

The boom of these derricks is in two 25-foot sections, providing a total length of 50 feet, and is made of heavy corner angles with bar-lacing riveted construction. The mast height is 23 feet 8 inches, and on the 4-ton model is made of two 8-inch channels with bar-lacing riveted construction, staggered on each face approximately 30 degrees. On the 6-ton model, 9-inch channels are used. The mast top is a steel casting, machined, bronze-bushed, and with bronze wearing washers, and the mast bottom is of the ball and socket type, with a cast steel ball and cast semi-steel step, machined and lubricated. The legs are 32 feet long, of two 6-inch channels with welded bar lacing staggered on each face 35 degrees, and set at 60 degrees for the 4-ton model, while on the 6-ton model the legs are made of two 7-inch channels with bar lacing staggered on each face approximately 30 degrees, and are set at 90 degrees. The sills are 20 feet 6 inches long on both models, of two 6-inch channels on the 4-ton model and 7-inch channels for the 6-ton unit. The bull wheel is of 8-foot diameter, and is made of channel rolled to a true circle, securely braced, with hog rods, and is provided with turnbuckles for adjustment. The sheaves are of all cast steel, graphite-bronze-bushed, and lubrication fittings are provided throughout. The 4-ton model weighs 8,000 pounds, and the 6-ton model, 9,000 pounds.

Further information on these new Ingram derricks may be secured direct from the manufacturer.

New Dealers Appointed To Handle Roadmixers

Announcement has been made by the Wood Mfg. Co., Los Angeles, Calif., manufacturer of the Wood Roadmixer traveling mixing plant, of the appointment of the following distributors: Arnold Machinery Co., Inc., 153 West 2nd St., Salt Lake City, Utah; Garlinghouse Bros., 2416 East 16th St., Los Angeles 21, Calif.; and Hardin & Coggins, 1717 North Second St., Albuquerque, N. M.

Previously announced distributors for the Roadmixer are: J. E. Ingram Equipment Co., 1146 West Laurel St., San Antonio 6, Texas; and Coast Equipment Co., 948 Bryant St., San Francisco 1, Calif.

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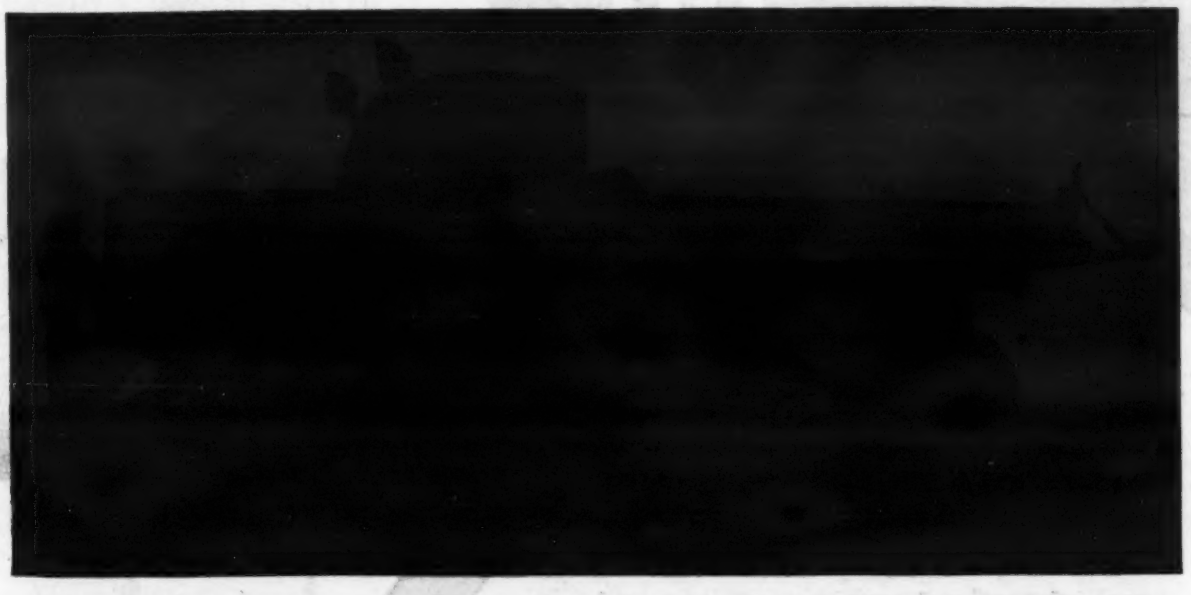

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Safety First . . *Remove Ice Hazards*

THE NEW WILLETT HYDRAULIC TRUCK-GRADER

is now available for Highway Departments

Cuts, breaks up ruts and ice off streets and roads quickest, cheapest way with rotatable curved moldboard, cushioned or rigid operation, blade pitched forward for ice cutting when desired; —all with full hydraulic power control of tilting, rotating, and reversing of curved moldboard from the truck cab.

IT CUTS! IT GRADES! IT MAINTAINS!

The above new "Willetta" on state highway trucks are doing a splendid job cutting and breaking up ice and general all year around maintenance. Many city and county highway departments are using "Willetts" with great success! Models for all makes of trucks, 1½ tons and up; standard lengths up to 14'; moldboards up to 17" wide; 10" to 15" clearance under lifted blade.

WRITE FOR LITERATURE, PRICES, ETC., ON NEW MODELS. PATENTED AND PATENTS APPLIED FOR.

Hot-Mix Surface Over Old Highway

New York State Maintenance Crew Resurfaces Section Of Montauk Highway; Uses Patented Asphalt Mix

✦ A SMOOTH mile-long ribbon of asphaltic concrete is covering the old, cracked and battered surface of concrete paving which was laid back in 1912-1916 on the Montauk Highway between West Sayville and Sayville, in Suffolk County, on the south shore of Long Island. The maintenance crew of District 10 of the New York State Division of Highways has completed another section of the 12-mile stretch of resurfacing between Bayshore and the Brookhaven town line. About 7.5 miles were resurfaced last year easterly from Bayshore through Oakdale.

One of the first concrete roads built on Long Island, this section of the Montauk Highway has stood the wear of weather and traffic remarkably well. The original paving was but 16 feet wide, of 4 11/16-6 11/16-4 11/16-inch section, with a parabolic crown. Monolithic panels, 45 feet long, were separated by wooden expansion joints. The paved surface was subsequently widened by the town to 36 feet, and in places to a 4-lane 48-foot roadway to carry traffic through the business sections of the villages.

The new black-top surfacing is a 2-inch compacted course of asphaltic concrete supplied under contract by the Suffolk County Bimasco Co. from its asphalt plant at Islip, 12 miles away. The hauling was done by the Good Roads Engineering & Contracting Co. of Wantagh, N. Y. The actual laying of the retread was done entirely by state highway maintenance forces.

Preparation for Paving

Prior to paving operations, manholes had to be raised by local utilities to meet the new grade. This increase was a minimum of 1½ inches, but in some instances greater height was needed, where the manholes had sunk, to make them flush with the new paving. The South Bay Consolidated Water Co. raised twenty manholes, while the New York Telephone Co. and the Long Island Lighting Co. had six each.

Preparation of the roadway for the new surfacing was simple. To insure a strong bond and to prevent scuffing and early scaling on thin skin patches, cracks were filled with a rapid-curing cut-back from a pouring can. Particular attention was paid to any oil patches, resulting from the drippings from trucks on the job or by passing cars. These patches were carefully sanded, and broomed to remove as much oil as possible to prevent its cutting the asphalt and leaving the stone unbonded.

Laying the Surfacing

The contract called for the material to be supplied to the spreader on the job site. Hauling the 12-mile distance from the plant was done by four Mack 6-ton trucks, each of which made eight to ten trips a day, with a round trip averaging 45 minutes. Six 1-ton batches constituted a truck load. Arriving on the job site, the trucks backed up to the state-owned Adnun Black-Top Paver, raised their bodies and were slowly pushed along by the paver until all the material had been deposited. The revolving paddles in the hopper distributed the hot-mix evenly to the roadbed. The screed oscillated 5 inches perpendicular to the axis of the road to spread the hot-mix evenly.

Traffic had to be maintained on this main east-west highway along the south shore of Long Island, so the paving was done in separate lanes. The center lane was paved first in order to maintain the parabolic crown of the original single-strip pavement, for it was easier to have the outside lanes meet the center than to make the center lane conform to the outer lanes. A 10-foot 6-inch screed with cut-off bars was set up on the paver for the center-lane paving. Later, when the side lanes were being paved, extensions were added, increasing the screed width to 12 feet 7 inches. The cut-off bars were removed so that the material could bleed out of the sides for feathering off onto the shoulders of the road in the open country, or meeting the curbing in the town. The lane widths averaged about 11 feet in the center and 13 feet on the sides.

Keeping the screed clean of sticky material which builds up and causes a drag on the bottom of the screed was a problem. Ordinarily an electric heating unit is installed to melt the asphalt from the screed and cutting bars, thereby insuring a constantly clean surface. Because of wartime restrictions, the engine supplied with the paver was not sufficiently powerful to operate a generator for the heating unit. To overcome this lack of a heating unit, a giant wooden "file" was made in the Division of Highways shops. This screed cleaner consists of a plank 13 feet long, 10 inches wide, and 3 inches thick. On the

(*Concluded on page* 23)

C. & E. M. Photo

As the usual electric heating unit on the screed was a wartime casualty, a home-made screed cleaner was developed by the District 10 shops of the New York Division of Highways.

THE bigger your prime movers, the greater yardage you're handling, the more need you have for tires that won't cake up and spin.

That's why more and more contractors are specifying Goodyear Sure-Grips. This great tire's time-proved O-P-E-N C-E-N-T-E-R *self-cleaning* tread has no dead-end pockets, no mud traps to fill up.

Its big, wide, unblocked channels sluice out dirt and stones, leaving those big, massive lug bars clean and free to bite deep and pull in any going.

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Add the greater toughness of Goodyear's exclusive multiple-compounded construction, plus the extra strength of Goodyear's Supertwist cord carcass, and you get the longest-lasting, hardest working tire ever built.

Just ask the men who are using them. Once you've heard their story, you'll want Goodyears on all your units.

THE RIGHT TIRE FOR EVERY JOB

HARD ROCK LUG for all rock work

ALL-WEATHER EARTH-MOVER for drawn vehicles

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Sure-Grip, Supertwist, All-Weather—T.M.'s The Goodyear Tire & Rubber Company

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MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Conn. Roadside Work Economically Handled

Plans and Estimates Made Before District Overseers Start Work; Well Organized Bureau Keeps Costs Down

By THEODORE REED KENDALL, Editor

✦ WITH economy as a watchword, the Bureau of Roadside Development of the Connecticut State Highway Department has, over the past five years, almost uniformly reduced the unit cost of the various items in its activities. Within the Bureau, work is done by force account but every job has plans and estimates made up first and then the District Overseer in charge of the job acts as the contractor and must stay within the estimate for the work which he has assisted in making.

Organization

The Bureau of Roadside Development is headed by John L. Wright, Director, and its normal organization includes from three to six Landscape Engineers and from one to three Landscape Engineers on public-utility control in the Division of Roadside Control. This latter is concerned with the use of roadsides by public utilities, such as telephone and telegraph companies.

The state is divided into four districts for the work of this Bureau, three of them being geographical and the fourth covering the Merritt and Wilbur Cross Parkways, each with a District Overseer in charge. Each district has from three to six highway foremen in charge of crews varying from seven to sixty men, as the work requires.

Within the Bureau, the Landscape Engineers make the plans in the office and figure the quantities for each job. The plans are taken to the District Overseer who must do the work at the estimated costs which are made jointly by a Landscape Engineer from the Headquarters Office and the District Overseer who does the work.

Cost Data

Every effort is made to keep the cost of roadside work as low as possible and still to keep the roadsides safe and save the investment which has been made in them so that the work will not slip back. This results in the conservation of manpower, funds and equipment.

The average cost of all roadside items per mile of highway is about $100 and this figure has been coming down because of the use of machinery wherever possible and changes in policy. For example, it is now the policy to mow only from the edge of the roadway back to the foot of slopes. This slightly increases the amount of work in the selective cutting of woody growth, but has greatly reduced the cost of mowing. Care is taken to increase the sight distance where essential to highway safety through selective thinning, but a large amount of this work is being left for later completion when the man-power shortage is not so acute.

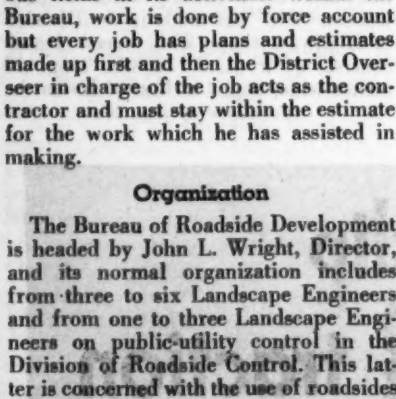
Further economies in the cost of maintenance operations during the current year will result from less tree pruning than usual, work being done only in cases which are immediately dangerous to traffic or where failure to prune will be harmful to the health and growth of the trees.

Right, a Bean spray outfit, one of nine power spray units owned by the Connecticut State Highway Department, for fighting insect pests. Above, filling the tank of a spray outfit at a local stream.

Of the 155 small roadside picnic areas in Connecticut, about 40 per cent have been closed since the start of the war, resulting in still further savings in the operation costs.

However, such activities as patrolling

(*Concluded on page 49*)



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Beebe Bros. All-Steel Hand Hoists carry the highest resale value of any piece of equipment in the world. If you have one not in use, sell it. Many more than are available are urgently needed in the win-the-war program. Thanks.

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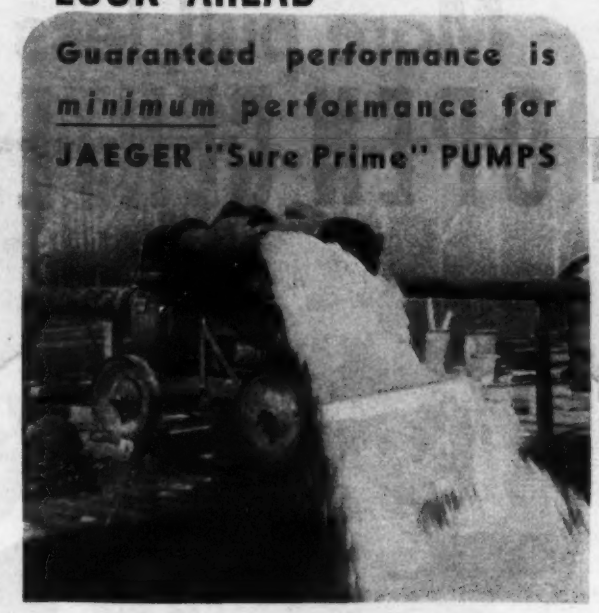

3000 Gallon "Bantam"

Contractors who watch their costs know there's a *big* difference between a Jaeger "Sure Prime" and an ordinary pump of the same size and rating. Jaeger Pumps are built to exceed their promises — deliver their rated capacity under tougher conditions, prime unfailingly and up to 5 times faster, assure you of thousands of *extra* hours of dependable cost-cutting service during the post-war building years ahead.

INDIVIDUALLY TESTED AND CERTIFIED for vacuum, capacity and pressure. Sizes 1½" to 10"; gas, electric or diesel power.

3"

10"

JAEGER DISTRIBUTORS in over 100 cities sell, rent and service "Sure Prime" Pumps.

LOOK AHEAD WHEN YOU PLAN

Jaeger's method of RE-MIXING ON THE SUBGRADE will meet tomorrow's specifications...

— the Spreading Screw does it!

Comparative tests by highway engineers have proved conclusively that the Jaeger Screw Concrete Spreader produces a more uniform and denser pavement slab.

By its thoro, positive re-mixing and inter-mixing of piles dumped on the subgrade, both segregation in the batch and the variations between batches are eliminated; badly placed batches are re-distributed to leave a uniform spread ahead of the Finisher; material is placed so solidly against road base and side forms as to eliminate the honeycomb problem and the entire mass compacted to a weight and density approaching that of vibrated concrete.

It is logical to expect that re-mixing on the subgrade will be specified to insure higher strength, longer life pavements.

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JAEGER-LAKEWOOD SPREADERS, FINISHERS AND BITUMINOUS PAVERS, FORMS, FORM TAMPERS—"DUAL-MIX" TRUCK MIXERS, AGITATORS—JAEGER HOISTING ENGINES, TOWERS

Company Changes Name; Three New Appointments

Because its old name had outgrown its original importance, with both manufacturing and sales locations now national in scope, the firm name of Willamette Hyster Co. has been changed to Hyster Co. With plants in Portland, Ore., and Peoria, Ill., and with branch offices throughout the United States and South America, the Hyster Co. makes tractor winches, hoists, cranes, and a complete line of industrial gasoline-driven lift trucks.

Three important personnel changes have also been announced by this company. W. B. Morrow, formerly Personnel Manager, will head up a new department of a confidential nature; Cliff Dunham, who has been in charge of the Hyster Chicago office, succeeds Mr. Morrow as Personnel Manager; and Donald Foster, of the Portland purchasing department, has gone to Chicago as Office Manager.

New Booklet on Heaters

New models and the exclusive features of Bros heaters for unloading asphalt from tank cars and storage tanks, for heating concrete aggregates on winter construction jobs, and for thawing frozen culverts are described and illustrated in a new booklet just issued by the Road Machinery Division of the Wm. Bros Boiler & Mfg. Co., 1057 Tenth Ave., S. E., Minneapolis 14, Minn. According to the company's announcement, these new heaters deliver full steam pressure in 20 minutes from a cold-water start.

Copies of this new booklet may be secured by interested contractors and state and county highway engineers direct from the manufacturer by referring to this item.

Tournapulls are designed and built for earthmovers by earthmovers with years of experience on actual earthmoving jobs. They know that speed and steadiness pay. You get both in Tournapulls.
PLAN NOW TO REPLACE
Obsolete Equipment
WITH THE FASTER POWER
OF TOURNAPULLS
YOU'LL GET MORE POWER FOR
DIRTMOVING
LUG LESS
DEADWEIGHT
WORK FASTER

Tournapulls move more dirt . . . move it faster and cheaper . . . because their working weight compared to power and capacity is much less than slower, track-type outfits—

Prime Mover and Equipment	Super C Tournapull & 15-Yd. Carryall	Tractor & 15-Yd. Scraper Approx.
Weight of Combined Units	31,000 Lbs.	53,500 Lbs.
Lbs. of Weight per Horsepower	207	411

Note that this difference in weight is the equivalent of 7.5 pay yards. Can you afford to lug that much deadweight back and forth on a 10,000-hour working life when you could be moving pay dirt with a Tournapull?

BIG TIRES REDUCE MAINTENANCE

Note, too, that the Tournapull has 150 brake horsepower for its working weight of 31,000—plus the flotation of big drive tires (21 x 24). These large tires give you plenty of traction with a minimum of wearing parts . . . also cushion the equipment against shock and reduce operator fatigue.

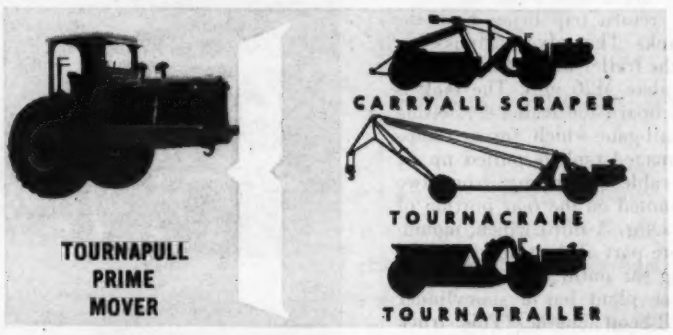
NO CHANGE IN OPERATING METHODS

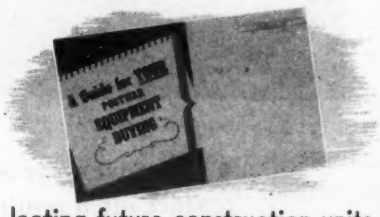
With Tournapulls you use the same time-tested LeTourneau operating methods that have proved so successful with tractor-scraper outfits—downhill loading, pushers for big-capacity scrapers, working cuts and fills in series, etc. But Tournapull speed enables you to complete round trips in ⅓ to ½ the time.

Why use slow-moving, overweight equipment, when you can have faster-moving, job-proved Tournapulls? You'll pay less, move more yardage . . . more profitably. Plan NOW to replace obsolete equipment with faster powered Tournapulls.

Only TOURNAPULLS Give You This Interchangeability

Cable control, with the job-proved LeTourneau Power Control Unit, makes possible these cost-cutting combinations —all with the same Tournapull prime mover.





Write Today for this "Postwar Equipment Folder." Tells what to look for and why in selecting future construction units. Address your request to Dept. CEM-944, R. G. LeTourneau, Inc., Peoria, Ill.

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RUBBER-TIRED POWER FOR FASTER EARTHMOVING

This big brute, known as the Tank Retriever, and field-tested in Africa, Italy, and now in France, will haul a load of 40 tons and, with slight modifications and the removal of armor, will be suited to heavy hauling jobs in the construction and similar industries after the war.

Heavy-Duty Trailers As Tank Ambulances

Contractors and highway department equipment men are conversant with the heavy-duty equipment trailers used to move slow automotive equipment with considerable speed from one job to another or to carry disabled construction and maintenance equipment to shops for repair. The Army has carried the heavy-duty equipment trailer one step forward in the Tank Retriever made by Pacific Car & Foundry Co., at Renton, Wash., and Billings, Mont. This unit, with slight modification, can be adapted to the heavy hauling requirements of the highway and construction field following the war, the manufacturer believes.

Reports of extensive tank battles in both Normandy and Saipan have focused attention on these Tank Retrievers. Used in both the Italian and African campaigns, it is easily assumed that these huge vehicles are playing an important part in today's action. The primary purpose of the M26 Tank Retriever is to salvage battle-damaged tanks, half-tracks, armored cars, amphibians and other heavy pieces of Army matériel. The M26 is a huge low-hung trailer approximately as long as a standard railway mail car, wider and not quite as high, and when loaded to capacity weighs 80 tons. These huge vehicles are used for cross-country service and are capable of traveling any terrain that a tank can travel.

The secondary use of the Retriever is as a tank carrier. They can be used to deliver new tanks into battle speedily, and on the return trip bring back the damaged tanks. The salvaged tanks are carried on the trailer which forms a part of the complete M26 unit. The tank is dragged on board the trailer by letting down the tail-gate which forms ramps and the damaged tank is pulled up by means of cables operating from two winches mounted on the rear portion of the truck tractor. A third winch, mounted in the fore part of the tractor, can be used to drag the outfit out of the mud.

The power plant has a six-cylinder 400-hp Hall-Scott engine. This truck tractor has ten wheels, two in front, eight in the rear, and the trailer has eight wheels in the rear, four abreast, equidistant, and mounted so they move independently, making it possible for the vehicles to cover ground that would be impossible to anything not so flexible.

The complete truck and trailer unit is 58 feet long, 12 feet high and 12 feet wide. The cab is completely armored and, for an emergency, contains a small stove, canned goods, water, gasoline and other types of equipment permitting it to operate without assistance for a long period. It is practically a traveling machine shop, carrying more tools than the average small garage and is equipped with welding and burning outfits.

Portable Steel Hangars Described in New Booklet

Simplicity of erection and saving of critical materials are among the advantages claimed for the new portable steel hangar designed and manufactured by the American Rolling Mill Co., Middletown, Ohio, and described in a new 24-page booklet just issued by that company. Two sizes of hangar have been built to date, one with an inside width at the base of 152 feet and a height of 36 feet 7 inches, and the other with a width of 192 feet and a height of 48 feet. The length may be any multiple of 17½ feet.

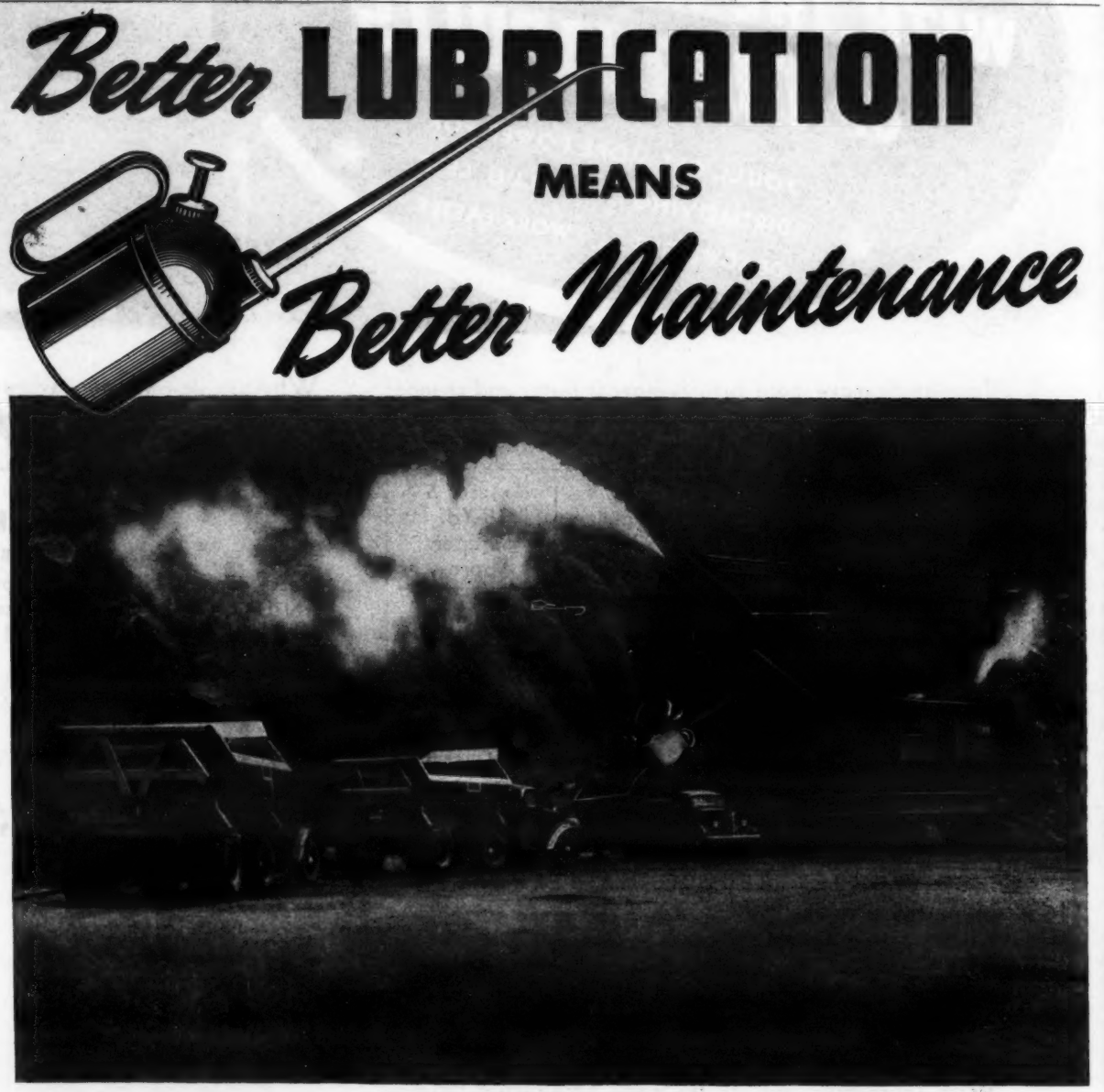
The arches, assembled at ground level, are made up of pressed metal units bolted together into segments which are identical and interchangeable, and are hinged to a corrugated base plate. By means of two 40-foot poles, two sheaves and a winch truck, an arch ring, which weighs a maximum of 3 or 7 tons, can be raised within 15 minutes, the manufacturer reports.

Further details on these units are given in the new booklet "Armco Hangar Buildings", copies of which may be obtained free by writing direct to the company and mentioning this magazine.

Col. Laird Resumes Position as Sales Mgr.

Lt.-Col. C. B. Laird, for many years Sales Manager of the Eagle Iron Works, Des Moines, Iowa, has resumed his duties with that company after three and a half years with the Mechanized Cavalry of the U. S. Army, from which he is retiring to inactive status.

While the man-power and equipment of the Eagle Iron Works will continue on vital war production, its officials state that many firms served by this company are now making plans for post-war installations of new equipment. Col. Laird's advice and counsel will be available to all Eagle customers in solving materials classifying and washing problems and in planning for post-war improvements.



• Excessive wear and difficult maintenance often result from inadequate lubrication.

Sinclair provides highly specialized Motor Oils, Gear Oils and Greases for *better lubrication* and better maintenance of *CONSTRUCTION EQUIPMENT* under continuous heavy duty operation. Sinclair Ten-ol 200 has been specially developed for proper lubrication of Diesel engines, and Diesel-powered shovels, buckets, and bulldozers.

• • •

(Write for "The Service Factor" — published periodically and devoted to the solution of lubricating problems.)

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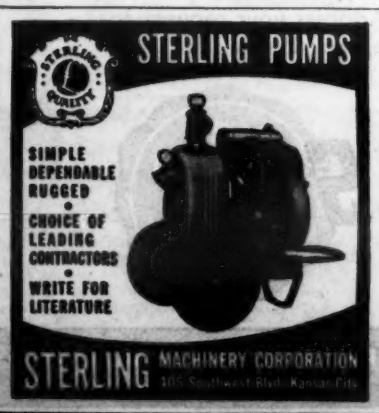
FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.



Ideas and Designs For Standard Bridges

All Bridge Designers Can Profit from the Methods Established on the New Alaska Highway

✦ ALTHOUGH the difficulty of transportation of steel members for the bridges on the Alaska Highway far surpassed any conceivable problems that might arise in any state or county within the borders of continental United States, there are many features of the design and handling of this wholesale bridge program worthy of study. Hundreds of thousands of bridges on our state, county and township highway systems will need replacing following the war. Great economies can be effected through standardization of design and the handling of steel members. The program of standardization in New England following the floods of 1936 showed that economical bridges can be designed and built without loss of esthetic values.

The Alaska Problem

Construction of the Alaska Highway required the building of many bridges over streams of all descriptions. In the initial penetration of the area in 1942, only temporary bridges were constructed. In the winter of 1942-43 an extensive program of permanent bridge construction was laid out. In planning this program, many problems arose that required careful consideration in order to meet the schedule. Many culverts and some bridges were built of wood or salvaged steel.

The new steel structures with span lengths of 40 feet and over, which required approximately 16,000 tons of steel, are discussed in this article. For speed and economy it was essential to adopt construction standards suitable for the major portion of the bridges. A number of the river crossings required individual attention and design of special structures, but these were taken care of during the course of the work.

Various types of river crossings had to be considered. There are streams with well-defined channels up to 1,000 feet or more in width, carrying a large volume of water throughout the year. In order to minimize construction difficulties and troubles from icing, and to cut the cost, special construction was needed. Some of the small streams, confined to narrow channels in ravines or gorges, could be spanned by simple construction. There are other small streams in broad valleys. For a good part of the year, these water courses carry only a trickle of water and are of a meandering, shifty nature. During flood season, the whole valley becomes a raging torrent of water, ice, and drift. A series of simple standard spans arranged to provide a proper drainage channel and underclearance could be used for these crossings.

Basic Specifications

American Association of State Highway Officials specifications were used as general specifications for all spans. A basic unit stress of 20,000 pounds per square inch, increased 20 per cent when wind stresses were included, was adopted to conform to the wishes of the War Production Board for the design of steel bridges during the emergency. Provisions were made for a 24-foot roadway and two 18-inch safety curbs. A clear height of 16 feet was maintained over the full width of the roadway. The loading was H20, except for a few special structures where H15-S12 loading was used.

The temperature varies greatly and allowance was made for a total range of 160 degrees F., with a normal of 30 degrees F. Although the highway is in northern latitudes with extremely low winter temperatures, its location east of the coastal range places it in territory where the annual precipitation ranges from 10 to 20 inches. For this reason no allowance was made for snow load.

Public Roads Administration Photo

The Johnson River Bridge on the Alaska Highway consists of four 200-foot through trusses and one 160-foot through truss at the far end.

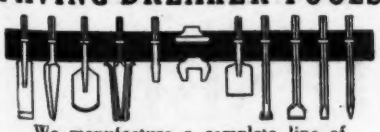
Designs and plans were adapted for either timber or concrete floors since it might be necessary to use timber floors on bridges finished during winter months. Provisions were made for steel guard rail, but wood was used in the original construction.

Packaging for Shipment

As the material was transported to

(*Continued on page* 58)

"BICKNELL BETTER BUILT"
PAVING BREAKER TOOLS



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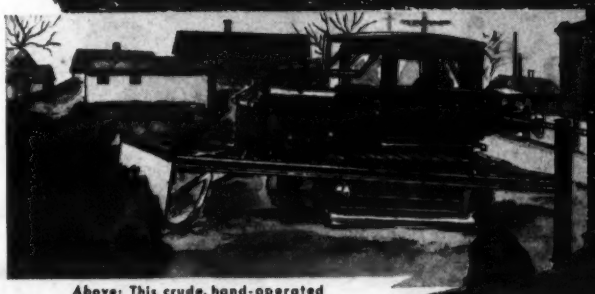
12 LIME STREET ROCKLAND, MAINE

More work... lower cost
THANKS TO LA PLANT-CHOATE "KNOW HOW"



Above: This crude, hand-operated LaPlant-Choate dozer was developed in 1923 for use on the famous Dixie Highway in Kentucky. Modern hydraulic and cable operated models offer numerous improvements in blade design, operating features and all around dependability.

DID YOU KNOW that the first LaPlant-Choate bulldozers were built for Best and Holt tractors long before the days of "Caterpillar" . . . that LaPlant-Choate pioneered the first production dozer with hydraulic control (1925)... a dozer with an angling blade (1927)... a tilting blade (1929)? Did you know that LaPlant-Choate engineers developed the first lightweight dozers and scrapers to be flown in transport planes (1942)... and the first dozers to be used successfully with Army tanks (1943)? Did you know that last year, according to official WPB figures, LaPlant-Choate built over 33% of all the dozers produced in the United States by 18 different companies . . . and that LaPlant-Choate now controls over 15 patents covering basic improvements in dozer design?

One of the main reasons for the world-wide popularity of LaPlant-Choate dozers is their proved ability to do *a better job at lower net cost.* In other words, when you buy a LaPlant-Choate dozer, you get more than just a blade in front of a tractor. You get an "engineered unit" developed and improved through *21 years of field experience* with thousands of LaPlant-Choate dozers in all parts of the world. Moreover, as one of America's largest suppliers of dozers to the armed forces, LaPlant-Choate is gaining additional experience that assures you of *even better performance* from LaPlant-Choate dozers in the future. So before you buy any new dozer equipment, be sure to get complete facts on LaPlant-Choate's new, improved line—with *either cable or hydraulic control.* LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa.

LAPLANT-CHOATE

North Texas County Highway Activities

Operations Within Revenue Permit Gradual Betterment Of Potter County Highway System; Normal Maintenance

✦ A BUSINESSLIKE administration with careful planning and engineering control has enabled Potter County, Texas, to maintain its existing road system, varying from little-used ranch trails to city streets in the urban areas outside city limits, in first-class condition, and still have sufficient funds available to improve the surface on some part of the mileage each year.

County and Its Government

Potter County, lying in the Texas panhandle at an average elevation of 4,000 feet, has an area of 930 square miles, with Amarillo, the seat of government, situated near its south boundary. The 282 miles in the county highway system consist of 42 miles of various types of asphaltic surface, 85 miles of all-weather roads, principally caliche bases with untreated surface, and 155 miles of dirt road, some of which are rarely traveled ranch trails. Included in this mileage are a considerable number of city streets lying in the suburban areas adjacent to Amarillo.

Six steel-truss bridges with spans of from 30 to 60 feet and wooden floors are included in the system, as are fifty-one pile bridges containing one to three 15½-foot spans built to standards similar to those in use by the U. S. Forest Service, with treated-timber piles, caps, and backboards.

Road work, like all other activities in the county, is under the control of a Commissioners Court consisting of four men elected from the four precincts of the county to serve for two-year terms. The elected County Judge is the presiding officer of the Commissioners Court and votes only in case of a tie. Under Texas laws, the County Commissioners Court has almost unlimited powers and conducts all the business of the county. This Commissioners Court appoints the county engineer to serve for an indefinite period of time. The present incumbent in Potter County has occupied that position for four years and in this particular case is also the county surveyor, an elective office, although this is not necessarily true in all cases.

The present Commissioners Court, which consists of one engineer, two farmers and one insurance broker, is serving its second term and has made an enviable record for an efficient administration.

The income of Potter County which is used for road purposes is acquired from automobile license fees and amounts to approximately $150,000 annually.

Maintenance Problems

Maintenance of dirt roads and untreated caliche bases is conducted under the general direction of a county road foreman, with an average crew of twenty men, working with the county engineer. A Caterpillar No. 12, an Allis-Chalmers No. 55, an Austin-Western 99, and a Galion No. 101 motor grader are used for this work, which includes shaping of surfaces, shoulders and ditches. An old Servis motor grader is also used near an unbridged creek crossing in the northwestern part of the county to render assistance to loads experiencing difficulty in crossing.

In the dry climate of the county, the untreated caliche base has a tendency to blow away and form pot holes, and for this reason a progressive program of surface treatment is being conducted on a pay-as-you-go basis.

A 500-gallon Littleford trailer-type asphalt kettle with a pressure spray nozzle is available for use in light patching operations on the bituminous roads, but heavy resealing operations are awarded by contract to local contractors under competitive bids.

Painting and replacement of the wooden floors is the principal bridge maintenance expense, although a rather unusual hazard which requires attention in this county is the tendency for accumulations of dry tumbleweeds to form against the pile bridges, thus creating a serious fire hazard.

All materials, such as asphalt and seal-coat aggregates, used either for maintenance or construction operations are purchased by the county on competitive bids after advertising for two weeks, if the amount of purchase is more than $150.

New Construction

It is a policy of the county to do a moderate amount of new construction on the county road system each year, available revenues being used for this work without incurring any bonded debt.

A project under way in the spring of 1944 was the preparation of specifications for the purchase of a 500-cubic-yard-daily-capacity crushing plant, to be used in the caliche pits which are leased by the county on a royalty basis. With

(*Concluded on page* 33)

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CONTINENTAL RUBBER WORKS

ERIE, PENNSYLVANIA

Let's get every machine into the fight!

THERE isn't a thing within your power you wouldn't do to help win the war. You want to hasten victory; and to help save as many of the lives of our brave fighting men as possible.

What, besides buying War Bonds, aiding Bond sales, and doing essential work, can you contribute to the war effort? Here is something:

Rent, sell or trade any of your equipment that happens to be idle or which you can otherwise spare for more urgent uses.

The rising tide of the war effort is creating extraordinary demands for heavy construction equipment — especially track-type tractors. The War Production Board is asking for every piece of used equipment that can be gathered to supplement what the factories are able to build.

Most any machine, regardless of make, age or condition, can probably be used somewhere. Your Government will help find a place for it. Write or telephone the nearest War Production Board office. If you don't know its location or any of its personnel, your "Caterpillar" dealer will gladly help you make the proper contacts.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

TRACTORS • ENGINES AND ELECTRIC SETS • EARTHMOVING MACHINERY

The new Graco Block Buster for heavy-duty lubricating jobs.

New Fast Lubricator For Use in the Field

A new bucket pump to handle all heavy-duty lubricating jobs easily and quickly has been announced by the Gray Co., Inc., 60 11th Ave., N. E., Minneapolis 13, Minn. This new unit, called the Block Buster, is particularly adapted for lubricating trucks and contractors' equipment.

A few of the important features include an easy-operating double-acting pump developing 4,000-pounds pressure; a hardened-steel precision-ground piston; a simple positive foot valve; an 18-gage seam-welded container with a pump-support bracket which keeps the pump from being completely removed when filling; and a strong carrying handle which acts on a large stud bolt to hold the cover and pump in position on the container. The conical-shaped hopper bottom automatically feeds all the lubricant in the container to the foot valve and prevents channeling and loss of prime.

The Graco Block Buster can be obtained with 5½-foot or 10½-foot hydraulic adapter-equipped hose assembly, giant buttonhead coupler-equipped hose assembly, or standard buttonhead coupler-equipped hose assembly. This new lubricator is completely described in Folder BB-644P which may be secured direct from the manufacturer by mentioning this descriptive text.

Engineering Jobs Open Now in Federal Agencies

Persons to perform subprofessional engineering work in civil, topographic, photogrammetric, mechanical and other branches of engineering are being sought to fill Federal jobs in Washington, D. C., and in other parts of the country. The salaries range from $1,752 to $3,163, including overtime pay, and many appointments will be made in the U. S. Geological Survey, Interior Department, the Coast and Geodetic Survey, Department of Commerce, and the Department of Agriculture.

The grade of the position for which an applicant is considered will depend on the amount and character of his experience and training. There are no age limits for these positions and no written test will be given, but all applicants are required to have had training or experience in some branch of engineering.

Full information and application forms may be secured at first and second-class post offices, from the U. S. Civil Service Commission's regional offices, or from the central office of the Commission, Washington 25, D. C.

Survey on Post-War Public Construction

Representative William M. Colmer of Mississippi, Chairman of the Special House Committee on Post-War Economic Policy and Planning, has requested the Federal Works Agency to make a nation-wide survey of contemplated public works construction, to aid the Committee in investigating all matters relating to post-war economic policies and problems.

The survey asks governors, county executives and mayors of cities over 10,000 for the following information:

1. The dollar volume of the projects on which final plans have been made for post-war construction; that is, projects on which construction could be initiated on very short notice.
2. Projects on which final plans are in process of preparation.
3. Projects on which preliminary plans have been completed or are in process.
4. Projects contemplated as desirable but on which no plans other than preliminary estimates have been made.

In addition, the report will show what funds or reserves have been set aside for financing post-war public works. The information will be tabulated by the Bureau of the Census.

The types of projects embraced in the survey are:

1. Highways, streets and roads, including culverts; drainage facilities, sidewalks, curbs and gutters; guard rails, highway and street lighting, traffic-control facilities; roadside landscaping and other similar work. Federal-Aid and state highway projects are not included.
2. Bridges, viaducts and grade separations, excluding Federal-Aid and state highway projects.
3. Airports, terminals and landing strips, including runways, taxi strips, aprons, airport drainage facilities, lighting facilities, seaplane ramps and landing platforms, airway markers and beacons, airport buildings including hangars and terminal buildings, and other airport and airway facilities.
4. Sewer, water and sanitation facilities including water treatment plants, mains, wells, storage tanks, reservoirs and pumping stations; sewer systems, such as sewage treatment plants, storm, sanitary and trunk-line sewers; incinerator plants; and similar facilities.
5. Schools and other educational facilities; public libraries; hospitals and health facilities; other public buildings, including city halls, police and fire stations, and community buildings.
6. Recreational facilities.
7. Miscellaneous public facilities not included in the above, such as public gas and electric plants and distribution systems; public transportation facilities; docks, wharves, piers, retaining walls, jetties, breakwaters, river banks, shore improvements, stream bed improvements, irrigation systems, other than Federal projects, and similar projects.

DURING the past 18 months, hundreds of Lorain owners and operators have found the Emergency Fix-It Handbook a big help in keeping going—and it can do the same for anyone else who is struggling along with continued use of aging equipment—working at longer hours, under heavier wartime loads, encountering delays in spare parts deliveries.

This 28-page Handbook contains 32 ideas on how to rebuild worn parts for further use—how to substitute for critical, hard-to-get materials—how to make emergency repairs that will keep your unit on the "front line". Though written for Lorain cranes and shovels, most of the methods given, with no or only minor modifications, may be applied to many other makes of cranes and shovels—and even to many other types of construction equipment.

Even with our war successes, no one yet knows when new equipment will again be available. In the meantime you must keep producing. Therefore, isn't it worth sending a penny postal request to Thew-Lorain and getting a copy of this helpful Emergency Fix-It Handbook? Do it today—there's no obligation.

THE THEW SHOVEL COMPANY • Lorain, Ohio

Reg. Trade Mark
thew-Lorain
CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

Carey Elastite EXPANSION JOINT
Standard in Concrete Construction for 31 Years
ECONOMICAL and EFFICIENT
Asphalt Joint
Fiber Joint
Sub-Grade Felt
THE PHILIP CAREY MFG. CO.
Dependable Products Since 1873
LOCKLAND, CINCINNATI, OHIO

Airport Facilities At Newark Extended

(*Continued from page* 1)

national and twelve Caterpillar D7 tractors with bulldozers worked along with the shovels.

Working 'Round the Clock

As many as 300 trucks, varying from 6 to 12-yard capacity, were used at one time on this earth-moving project. Maintaining a minimum 10-second headway, they rolled over U. S. Routes 22 and 1, considered among the busiest highways in the world. Each truck averaged about 14 trips a day while the drivers worked two 10-hour shifts. Two hours in the morning and two in the evening were assigned for checking the trucks. Gas stations, forced out of business by war restrictions, were taken over by some of the large truckers and converted into field repair shops. Equipment was installed and motors were even rebuilt by the roadside. Subcontractors supplied the trucks which included diesel-powered vehicles and coal trucks from New York, Pennsylvania and Maryland. Payment was by the load and it was difficult to keep enthusiastic owner-drivers within the speed limits.

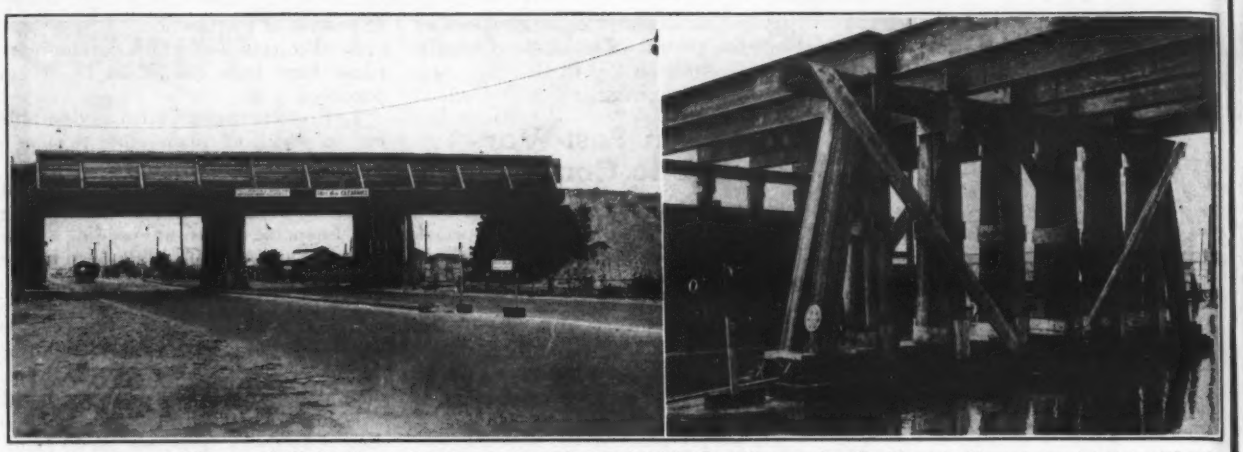
As the trucks left the borrow pits they were driven over a bump, thereby either settling their load or losing the unstable surplus, with the intent of keeping the roadway as clean as possible. Nevertheless, sweepers had to be assigned to the highways, for OPA inspectors were concerned over possible damage to tires caused by the abrasive action of the gravel lying on the road. A temporary bridge was built across U. S. Route 1 to give the trucks their own right-of-way to and from the airport, thereby avoiding traffic congestion. Thirty-inch steel girders on timber bents provided a 30-foot roadway for this three-span trestle.

An additional source of borrow was 80,000 yards of material which was brought to the Port of Newark as ship's ballast from England. Vessels were unloaded at the piers in the city channel and trucks made a short run to the airport with the assorted sand and stone material.

When the selected borrow was dumped at the site, it was pushed out over the swamp land in 2½-foot layers. Other equipment, in addition to that mentioned previously, which helped to place and spread the gravel included a 2-yard Speedcrane, a 1-yard Lorain crane, six Caterpillar No. 12 motor patrol graders and six Caterpillar diesel D8 tractors. Settlement was gradual but an occasional mud wave would appear which had to be dug out. In some areas of the marshland, a 10-foot mud wave had to be stabilized before the landing-strip fill could be stabilized, while in other sections of virgin meadow land, where cat-tails grew 10 feet high, the selected borrow was placed with no resultant mud waves. The fill was constantly rolled by 3-wheel Buffalo-Springfield 10-ton rollers and sheepsfoot rollers working over the subgrade, a total of twelve rollers being used.

Fifteen electric light plants, powered by gas engines and mounted on timber towers 20 feet high, were set up to light

(*Continued on next page*)



This temporary bridge was built by the contractors to carry heavy truckloads of borrow for the Newark Airport over U. S. 1 without interference with traffic. At right, a detail of one of the bents.

Tru-Traction* means MORE Traction FASTER Work MORE Profit

*Tru-Traction is power on BOTH tracks at ALL times—and you get it only with CLETRAC TRACTORS

WHEN post-war *planning* is converted into ACTION, much will depend on the equipment you have for the big jobs ahead. Power and traction will be most important.

For ordinary jobs of earth moving, bulldozing and hauling, any equipment may suffice, but when the going is tough and competition is keen, the advantage is with the contractor who is equipped with Cletrac power and traction.

There is a good reason why the use of the Cletrac Tru-Traction principle of power on both tracks at all times has been applied to all high-speed full tracklaying military vehicles. The effectiveness of this principle (Controlled Differential Steering) has been proved over and over again, in mud and muck, over rocks and hills, the world over. This Tru-Traction principle is exclusively a Cletrac development and used solely in Cletrac Tractors for more than 25 years. It is a principle that will earn dividends for contractors whose profits depend upon power, traction, and economy of operation.

Prepare now for postwar needs. Write today for complete information about Cletrac Tractors, including the new booklet "In War and Peace Cletracs Do the World's Work."

AVAILABLE for Essential Civilian Use

While Cletrac is still producing to meet the demands of war with a large part of its standard tractor production required to meet present military contracts, over-all production of Cletracs is sufficiently large so that a substantial number of Cletracs are being released for essential civilian use. These tractors are allocated according to government regulations. Your Cletrac dealer will gladly assist you in making application for a new Cletrac if you can qualify as an essential user.

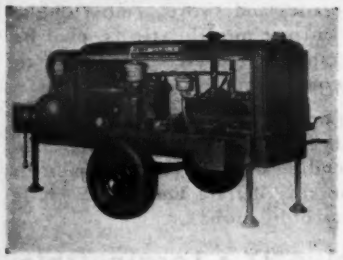
Write for booklet "In War and Peace Cletracs Do the World's Work"

THE CLEVELAND TRACTOR COMPANY • 19300 EUCLID AVE., CLEVELAND 17, OHIO

CLETRAC *Tru-Traction* TRACTORS

GASOLINE OR DIESEL

OK PORTABLE AIR COMPRESSORS



Single-stage or two-stage; equipped with gasoline or diesel engines or electric motors, and with steel or rubber-tired wheels (solid or pneumatic). Sizes: 85, 105, 160 to 210 cubic feet at 100 pounds pressure.

Write for Latest Complete Catalog

O. K. CLUTCH & MACHINERY CO

Newark Airport

(Continued from preceding page)

the site for night operations. By day each truck carried a yellow pennant and by night a red light on the top of the cab to indicate to fliers that they were moving vehicles.

Army-Navy "E" Award

Work was started in June, 1943, and by October such a fine record of achievement had been accomplished that the contractors were awarded the Army-Navy "E". Peak production was reached when 35,000 yards were moved in one day. At one stage in the construction 535 men were employed. Labor-management relations were amicable throughout and no time was lost in disputes or stoppages.

Ten Miles of Pipe

Drainage operations proceeded concurrently with the earth moving. Ten miles of practically all sizes of drainage pipe were needed. The 8-inch pipe was vitrified clay but all larger sizes to 48 inches were of reinforced-concrete construction. Seven tide gates on Bound Creek and Peddie diversion ditches control the flow of these channels which pass under two of the new runway extensions.

Large reinforced-concrete culverts were built for these drainage ditches. Two culverts of Type I, three barrels across, carry the east-west runway and a connecting taxiway. Each barrel is 5 feet 8 inches square. The culvert length under the runway is 632 feet and under the taxiway 174 feet. The culverts are supported on creosoted-timber piling, 1 foot in diameter and 40 to 50 feet long, averaging 3-foot spacing on centers, driven to resistance by a McKiernan-Terry 9-B-3 pile driver. The pile cut-off elevation was minus 4 to minus 5 feet. A 1-foot layer of gravel borrow followed by 2 feet of crushed stone composes the 3-foot cushion for the culvert bottom. Truck-mixed concrete was poured into plywood forms and vibrators were used constantly.

Similar construction details apply to the three larger Type II culverts which have eight barrels abreast, each 6 feet 8 inches square, and are 1 foot 6 inches thick at the bottom. A 600-foot culvert carries the northeast-southwest runway; two culverts, each 154 feet long, support the two parallel taxiways. For these wider culverts the same foundation cushioning was used, a layer of 1-foot gravel borrow and 2 feet of crushed stone being placed 6 inches below the pile pattern. Riprap, 18 inches deep, was placed on both sides and bottom of the ditch to a line 20 feet beyond the faces of the headwalls on all culverts.

Ground-Water Problem

With the poured structures completed, the field drainage pipes were next installed. The large 36-inch, 42-inch and 48-inch sizes, which empty directly into the diversion ditches, were laid first from the outflow back into the field. Joints in these large pipes were sealed. A dragline was used for excavation but only 50 feet of trench was opened at a time. A pump at each end of the cut immediately began removing the ground water. When dry, the trench was backfilled with selected borrow for a 2-foot depth. Wooden stringers were then placed on this cushion to act as a bearing surface for the pipe. Six-inch-square treated timber supported the 24-inch pipe, while 8-inch-square stringers sustained the larger-diameter sizes. Blocking was used as needed at the bell-and-spigot joints. The dragline, with bucket laid aside, was used to lay the pipe. Another foot of selected borrow was then placed alongside the pipe. The larger-size pipes were placed 5 feet below the level of the marshland, or 10 feet below runway grade. Two feet of water would accumulate in these deep trenches over night, but only 2 or 3 inches gathered in the smaller pipe trenches which were about 4 feet below runway grade. Joints in the smaller pipe were left open. A Koehring 1-yard backhoe was used in laying the 12-inch drainage pipe.

A 2-inch bituminous-concrete wearing course was laid on a 3-inch penetration-macadam base for the extensions of the 150-foot-wide runways at the Newark Airport. The three major runways were lengthened 1,950, 3,100 and 3,900 feet, respectively.

A combination of open and close-joint pipe is used in draining the field. The runways, 150 feet wide, have a parabolic crown varying from 3⅜ to 9 inches which permits surface water to run off over 1 per cent seeded shoulders into ponding areas and drainage inlets or into parallel open ditches. Eight and 12-inch subdrains parallel the runways at about 25 feet from the sides, and empty into the storm sewers of larger-

(Concluded on page 78)

$25

Saves $500

PINOLA preserves your lumber. PINOLA eradicates Termites. Termites eat while you sleep. Give them time and you won't have a place to sleep.

Lumber properly treated with ***PINOLA*** is the equivalent of Original Heart Pine. Twenty-six years of test prove it best. Every user of ***PINOLA*** is a booster. If your dealer cannot supply you write to us.

THE *PINOLA* COMPANY
Savannah, Georgia

GREEN HANDS

ON THE JOB
GREEN HANDS
IN THE SHOP
multiply the problem of keeping valuable overworked Motor Equipment running efficiently and economically!

One GOOD Answer
to the problem is to use finest lubricants . . . and

Keep the Oil Clean with

WINSLOW Oil Conditioning Units

More than ever your truck and tractor engines need the protection of Winslow Oil Condioning to help overcome the maintenance difficulties created by "Green Hands" . . . to stop excessive engine wear, to extend the periods between overhauls, to reduce oil and gasoline or Diesel fuel consumption and to increase operating efficiency.

Winslow Full-Flow Filter Elements remove all kinds and sizes of abrasive substances, absorb varnish and sludge and neutralize acid forming products of combustion. All this is accomplished WITHOUT REMOVING the valuable ADDITIVES which give modern COMPOUNDED oils their high lubricating efficiency.

WINSLOW Filter Units are available to meet any capacity or need, and there's a Winslow Replacement Element to fit nearly all makes of filter cases. These elements can be changed, in most instances, without breaking oil lines.

HIGH CAPACITY LONG LIFE

For Complete Franchise Information, Write

WINSLOW SALES CO.
406 Montgomery St., San Francisco 4, Calif.

WINSLOW
OIL FILTERS • CONDITIONERS • ELEMENTS

Traffic Engineer Joins International Salt Co.

Lloyd B. Reid, Traffic Engineer of Detroit and an authority on highway engineering, has joined the International Salt Co., Inc., as a consulting engineer. In his new post, Mr. Reid, who was formerly Michigan State Highway Commissioner and is well known in the highway management field, will assist in an aggressive program to maintain highways free of snow and ice during the winter months through the use of rock salt during storms.

Many cities, including New York, Syracuse, Cleveland and Detroit, and a number of states in the snow belt use rock salt to melt snow and ice and thus simplify the task of keeping highways and streets open. In the company's program, various groups of road users will be invited to cooperate in this ice-control plan, along with local business associations.

Portable Light Plants

A new folder on portable plants to provide light for emergencies and for night construction has been issued by the Clark Supply Co., 245 E. Keefe Ave., Milwaukee 12, Wis. The Clark emergency portable light plant is a self-sufficient unit mounted on a handy two-wheel truck, so that it can be moved about to any part of the job, and supplies 500 watts of electricity. Included in the outfit are one 200-watt and one 150-watt floodlight on adjustable standards, and one 150-watt projector-type spotlight with weather-proof holder. All of this equipment is carried in brackets on the hand truck.

Further information on the details and uses of these portable light plants is contained in the new folder, copies of which may be secured by those interested direct from the manufacturer. Just mention CONTRACTORS AND ENGINEERS MONTHLY.

Willis Returns to Pemco

After nearly four years of service with the Corps of Engineers, Captain "Jimmy" B. Willis has returned to the Technical Laboratories of the Pemco Corp., Baltimore, Md., manufacturer of porcelain enamels. Capt. Willis commanded a company of Amphibian Engineers in New Guinea, was evacuated to Australia because of illness, and was recently retired from active service.

ATHEY FORCE-FEED LOADER

Helps Maintain 1600 Mile County + State Highway System

LaVern A. Kohn, Dodge County (Wisconsin) Highway Commissioner, has a lot of praise for their Athey Force-Feed Loader because "it has exceeded all of our expectations in its performance," to use his own words.

In maintaining Dodge County's 1600 miles of highway, including State highways in its care, the Force-Feed Loader is playing an important part.

"Caterpillar" Motor Grader cleans out ditches.

Much of its present operation is cleaning up windrows of excess material removed from clogged ditches.

Their "Caterpillar" Motor Graders grade the ditches, throwing out windrows of sand, washed soil, sod and debris which has accumulated and interfered with drainage. The Force-Feed Loader quickly and easily picks up the material from the road surface and loads it into trucks, which carry it to a fill. Time and manpower are saved—material is salvaged.

"No other methods," writes Mr. Kohn, "could do the job as satisfactorily or economically as the Athey Force-Feed Loader."

Mr. Kohn also says, "The loader is used for handling loose rock, gravel, oil mix material and snow with completely satisfactory results."

Many other Highway Officials are using Athey Force-Feed Loaders on road maintenance and construction and finding them the lowest cost, most versatile loading tool available.

23 truck-loads in 25 minutes!

Write today to your Athey-"Caterpillar" Dealer or to Athey Truss Wheel Co., 5631 W. 65th St., Chicago 38, Ill., for a new folder describing the Force-Feed Loader.

After the Athey Force-Feed Loader and "Caterpillar" Motor Grader have finished the job. Wide, clean drainage ditches and road surfaces mean better highways for Dodge County, Wisconsin.

ATHEY

FAST, DEPENDABLE LOADING EQUIPMENT

Major Repairs Done At Central Location

Montana Repairs Big Units In Well Equipped Central Machine Shop in Summer For Maximum Winter Service

(*Photo on page* 88)

✦ THE Central Shops, consisting of five buildings in Helena, are operated by the Montana Highway Commission to keep its heavy units functioning at peak efficiency during their season of use. In the summer, snow-handling equipment undergoes major repairs while during the winter, when the snow fleet must be out on the roads, work on shovels, screening and crushing plants, and bituminous equipment keep the Helena shop going at top speed.

The Central Shops, which have developed gradually over a long period of years, starting when surplus equipment from World War I was made available to the states in 1919, occupy part of the state fair grounds. There is a fenced area of approximately 10 acres with five frame buildings, some of which are covered with corrugated-metal sheeting. Entering the yard through the east gate, the visitor finds the largest building, housing the offices and main machine shops, directly in front of him. This building, 40 x 200 feet in size, is flanked on the south by two buildings 25 x 100 feet, one of which houses the carpenter and sign shops, with the second building used for storage of parts and supplies. North of the main building and farthest east is another large building occupied by the motor shop, and in its south end is the room where heavy equipment is cleaned before overhauling. Just west of this building is an enclosed, unheated shed with compartments for storage of rolling equipment not in use. All doors of this building open to the south. Farther to the west and adjacent to railroad trackage is a 20,000-gallon gasoline storage tank with pump house and a 4,000-gallon tank for the storage of road oils.

In each of the ten maintenance districts of the state there is an auxiliary shop, less completely equipped, which handles repairs to lighter equipment, including trucks and automobiles, with the exception of major motor overhauls which are all done at the Central Shop. These district shops have lighter presses, smaller lathes, welding equipment, and drill presses, battery chargers, valve-facing machines and similar equipment with which to carry on routine repairs for the districts. All are housed in substantially constructed and adequately heated buildings and the large volume of repair work they are able to perform materially lessens the demands on the Central Shop organization.

Carpenter and Sign Shops

The carpenter shop in Helena has a Delta jointer and power saw, a Porter-Cable portable sander and portable power saw with benches, vises and clamps necessary to handle a variety of work. The east end of this building is set aside for storage of coal for the large stove used to heat the building, lumber storage, and a shop-built broom-winding machine.

The sign shop, occupying another room in the same building, is equipped to handle sign painting by the screen method and decalcomania transfers as well as by hand lettering.

The second building, immediately to the west, houses the warehouses in which are stored the hundreds of small items necessary to the successful operation of

(*Continued on page* 56)

Exterior of the Montana Highway Commission's large machine shop, one of the five buildings comprising the Central Shops in Helena.

POWER TAKEOFF CONES

From making the first brake lining to stop a car going backward, to production of a brake block to stop a 30 ton bomber, Raybestos has kept progressively ahead — winning universal consumer acceptance by assuring the exactly right friction material for every make, model and job. ★ Tomorrow the application to civilian use of Raybestos' war-born advanced friction materials, such as the remarkable "1492" bomber brake block, will provide you with still finer brake linings and clutch facings. ★ It pays in dollars and cents to make Raybestos your choice.

THE RAYBESTOS DIVISION of *Raybestos-Manhattan, Inc.*, BRIDGEPORT, CONN.

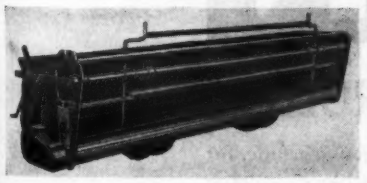
Raybestos

FRICTIONEERS to AMERICA

Manufacturing the most complete line of highest quality metallic and non-metallic brake linings and clutch facings for every type of equipment, war and civilian. Also fan belts and hose

INVEST IN AMERICA
BUY BONDS

SPEED--EFFICIENCY



The words "Speed and Efficiency" are synonymous with the BURCH FORCE FEED SPREADER. Dual feed control and many other new features found only on the Burch. See your nearest distributor or write for Bulletin.

Manufactured by

THE BURCH CORPORATION
Crestline, Ohio
Equipment Since 1875

BUY BONDS

Flexible-Pavement Design Depends on Subgrade Soils

Joint Project Will Make Soil Bearing and Pavement Tests to Obtain Data for Better Highway Design

✦ SINCE all highways and pavements, of whatever design, are supported by the soils which constitute the top layer of Mother Earth, the relationship between the characteristics of the soil and pavement design is a matter of extreme importance in planning paving projects. Discussing the subject of soil bearing tests and flexible-pavement design at the First Illinois State Asphalt Conference at Springfield, Ill., last February, Prevost Hubbard, Chemical Engineer, The Asphalt Institute, pointed out that there are three ways in which a pavement laid on a soil base may maintain or increase load support. These are: (1) By protecting the soil from absorption of moisture; (2) By confining the soil; and (3) By distributing the wheel load over a larger area than if the load rested directly upon the soil. Asphalt may be made to serve all three requirements, but some knowledge of asphalt products is necessary in order to utilize them to maximum advantage for these purposes, Mr. Hubbard said.

The Action of Asphaltic Materials

When liquid asphaltic material, such as road oil, is applied to the surface of an earth road, it is partially waterproofed and the surface made more resistant to displacement under moving traffic. Little or nothing has been added to the structural strength of the soil, although, because the oiled surface tends to shed water, loss of structural strength due to the presence of excess water is prevented to some extent. Repeated surface treatments produce progressive improvement to the extent that they further waterproof the surface.

A layer of compacted gravel or broken stone placed on soil distributes a concentrated wheel load over a larger area when it reaches the soil than would be the case if the layer of stone or gravel were not present. The soil is therefore subjected to less localized stress and structural strength has been added by the layer of gravel or stone. The thicker this layer, the greater becomes the strength of the road structure. However, gravel and broken-stone layers are not waterproof and, besides allowing water to percolate into the soil, they themselves suffer loss of load-supporting value by becoming saturated during long spells of wet weather. Surface-treating the gravel or stone with liquid asphaltic products, or with a hot asphalt cement which becomes semi-solid at normal air temperature, will eventually waterproof the road against surface water. But here again no additional structural strength is imparted to the road, and wheel loads reaching the soil are of practically the same intensity as though the asphalt were not present.

If, however, a mass of well graded gravel or broken stone is heated and mixed with hot asphalt cement and then laid in a compacted layer upon the soil, greater structural strength is produced than by an equivalent thickness of gravel or stone alone. This is due to the fact that the gravel or stone particles are cemented or held together by strong films of asphalt cement which surround each particle of mineral aggregate. Moreover, the entire mixture is thoroughly waterproof and not only prevents surface water from reaching the soil but also from being absorbed by the mixture itself.

Such mixtures, known as asphaltic concrete, have demonstrated, over a long period of service history on highways and streets, their ability to carry successfully the heaviest and most destructive types of traffic, provided they are laid on a properly constructed stable base. The asphalt cement present in asphaltic concrete is a semi-solid plastic material which imparts a considerable degree of flexibility to the mixture, as well as relatively high tensile strength. While the mixture can bend or flex to a marked extent without failing, it has a high resistance to bending under a suddenly applied or moving load and therefore exerts a high confining effect when placed over soils requiring confinement to develop their best supporting value.

Determining Bearing Value of Soil

The supporting value of asphaltic concrete should always be considered in terms of underlying support or the additional support it produces in the entire highway structure, including soil or subgrade.

Engineering evaluation of such relationships is of rather recent origin. Considerable general information regarding thickness design of flexible pavements has, of course, been developed by local experience with such pavements constructed over practically all types of soil, but there is need for more exact knowledge on this subject in order to design safely without overdesigning our pavements.

In 1940, The Asphalt Institute started an investigation of this subject on as large a scale as possible with the laboratory facilities it then had available. The general procedure was as follows:

A heavy metal box, 2 feet square and 1 foot deep, open at the top, was packed full of soil. The supporting value of the soil was then determined by placing heavy circular steel disks of various diameters upon the upper sur-

(*Continued on page* 40)

1907 GALION 1944

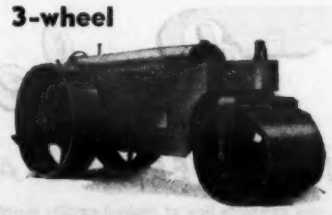
MOTOR GRADERS • ROAD ROLLERS

A heavy duty Galion motor grader is shown above. A rugged machine for the rugged jobs on County and State highways. Galion road machinery is doing a big job with our armed forces . . expects to continue with even more progressive construction in the post-war era.

The GALION IRON WORKS & MFG. CO.

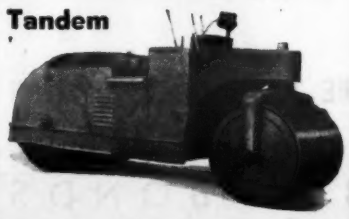
Main Office and Works: Galion, Ohio

3-wheel



Portable

Tandem



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USE AEROIL THE FAMOUS HEET-MASTER

80, 115 and 165 gallon sizes on skids and on steel wheels. Send for FREE Bulletin No. 194PC (specifications, prices, etc.)

AEROIL BURNER CO., INC.

5775 Park Avenue, West New York, N. J.

Chicago 16 San Francisco 7 Dallas 1

Phillips to Direct Sale Of Surplus Equipment

Ed. P. Phillips, well known in the construction-equipment distributor field, has been appointed Director of the Construction Machinery and Farm Equipment Section of the Treasury Department's Surplus Property Division. Mr. Phillips, who is a native of Richmond, Va., is the senior partner of the Phillips Machinery Co., with offices in Richmond and in Washington, D.C. He has been President of the Associated Equipment Distributors and a Vice President of the American Road Builders' Association, and is also a member of the Society of American Military Engineers.

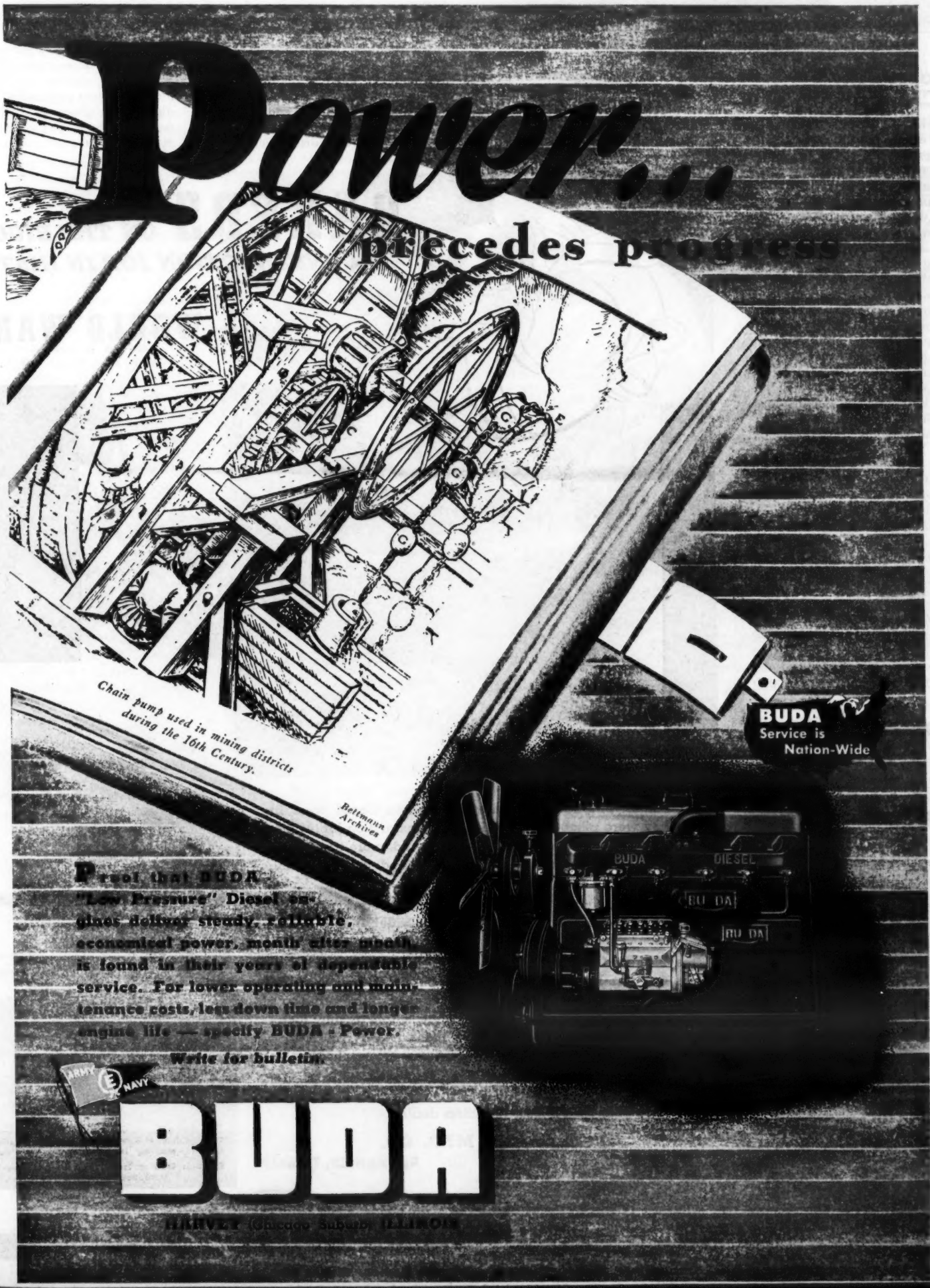
Mack Appointments

Announcement has been made by Mack Trucks, Inc., New York City, of the appointment of Dr. Walter M. Mitchell as Director of Research, to be in charge of all chemical, metallurgical, electrical, mechanical, diesel, fuel and lubricant, and other research activities allied to the truck firm's products. Dr. Mitchell has previously served as Chief Metallurgist for the York Safe & Lock Co.'s special ordnance plant, and as metallurgical engineer with Carnegie-Illinois and other U. S. Steel subsidiaries and with the Republic Steel Co.

Three new district managers have been named by Mack. In the northeastern division, E. W. Turnbull, formerly Assistant Division Manager, takes over the Akron branch as District Manager, while E. W. Atherton, formerly Manager at Akron, assumes the duties of District Manager in the division's Albany branch. In the southern division, J. A. Bascle, formerly a marine engine salesman for Mack, is District Manager of the New Orleans branch.

New Tandem Trailers For Hauling Girders

Crawler-track wagons which can be used in tandem to haul extra-length loads such as long girders or piles in any weather or on any kind of roadway are described in Bulletin No. 701-A issued by Athey Truss Wheel Co., 5631 W. 65th St., Chicago 38, Ill. These Athey Forged-Trak wagons are made in 10, 20, 30, and 40-ton units. Complete information and specifications will be found in the bulletin which will be sent promptly by the manufacturer to those mentioning this item.


Power...
precedes progress
Chain pump used in mining districts during the 16th Century.
Bettmann Archives
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Service is
Nation-Wide
BUDA DIESEL
Proof that BUDA "Low Pressure" Diesel engines deliver steady, reliable, economical power, month after month, is found in their years of dependable service. For lower operating and maintenance costs, less down time and longer engine life — specify BUDA-Power.
Write for bulletin.
ARMY NAVY
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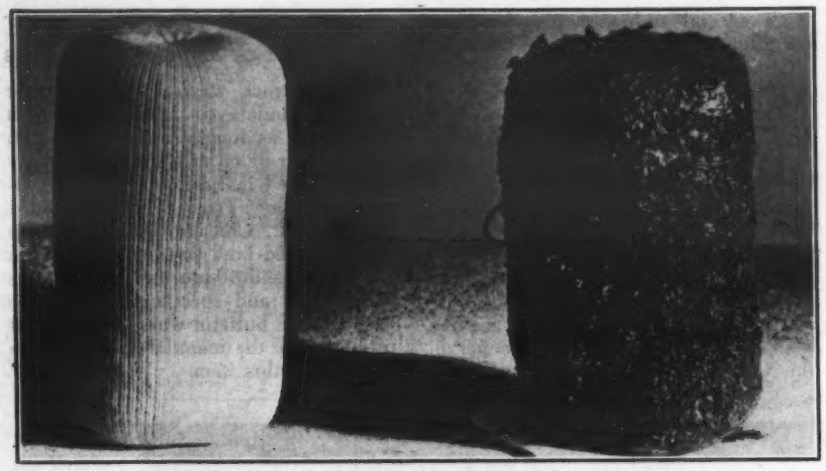


A Winslow oil-conditioning filter before and after using.

Removable Filters Clean Engine Oils

The problem of getting a maximum of service and efficiency from rapidly aging motor equipment is a matter of concern to most operators these days, but the problem can be solved to a considerable extent by proper oil conditioning, according to W. G. Nostrand, Chief Engineer for the Winslow Engineering Co., Oakland, Calif., manufacturer of oil-conditioning filters and replacement elements for all types of internal-combustion engines.

The importance of proper lubrication has been generally recognized for many years, especially by operators of heavy equipment, but the war has multiplied the maintenance problem to such an extent that "clean oil" for the engine has become a "must" measure in the program of minimizing operational interruptions and lay-ups for overhauls. Though the first essential in proper lubrication is good oil, this alone is not enough. It must be kept clean and free of dirt, grit, fine metal particles, carbon, sludge, varnish and acids caused by combustion. An efficient oil filter that will trap abrasive particles of all kinds, from the largest to the smallest, and which at the same time will absorb sludge and varnish and neutralize corrosive acids helps good oil perform the function for which it is intended.

An efficient oil filter should remove all of the harmful substances which cause excessive wear on moving parts of the engine, without removing the valuable additives which give modern compounded oils their high lubricating efficiency, Mr. Nostrand points out, adding that it is highly essential that filter elements be replaced before they become clogged and have begun to lose their ability properly to pass and clean a full flow of oil. Obviously the capacity of the filter element used is important, for the greater the capacity the longer its period of service before replacement becomes necessary.

A new folder describing the performance of the Winslow oil-conditioning element points out that its construction is such that it has an expanding capacity and large filtration area which assure an unusually long period of cleaning efficiency without clogging, and a tapering density which removes dirt of all kinds and sizes. These elements are available for either full-flow-in-line or shunt-type operation.

The complete Winslow line also includes filters and elements for cleaning diesel fuel oil, which, no matter how clean and pure it may be when it leaves the refinery, is likely to pick up much dirt, scale and other substances from tank cars, storage tanks and pipe lines. Because of the close tolerance in the fast-moving parts of diesel fuel-injection systems, foreign particles in the oil inevitably cause frequent shutdowns for overhaul.

Literature on these oil filters will be forwarded to readers of CONTRACTORS AND ENGINEERS MONTHLY on request to the Winslow Sales Co., 406 Montgomery St., San Francisco 4, Calif. Just mention this item.

Paint Manufacturer Buys Canadian Co.

The acquisition of a substantial interest in The Murphy Paint Co., Ltd., of Canada, has been announced by Pittsburgh Plate Glass Co., of Pittsburgh, Pa. Established over twenty years ago by Harry W. Thorp and Louis Hambrock, The Murphy Paint Co. operates factories at Montreal and Windsor, numerous branch warehouses and offices throughout Canada, and has become one of the most important paint manufacturing and distributing concerns north of the border. Mr. Thorp will continue as President of the Canadian company.

Also manufacturers of:
Pile Driver Leads, Grout Mixer and Ejector, Mine and Shaft Cages, Skips and Buckets, Air Locks, Subaqueous Equipment, Tunnel Shields, Pile Driver Hoists.

EST. 1900
Union Iron Works, Inc.
ELIZABETH, New Jersey

So you think Boulder Dam and the Panama Canal were big jobs? They were pikers compared to the construction job of them all—World War II. More earth is being moved, more trees dozed, more roads, bridges and buildings built and more buildings razed than on any other job at any time.

It's taking an endless amount of construction equipment of all kinds, including Baker Bulldozers and Gradebuilders by the hundreds.

This *Biggest Construction Job* calls for speed—that's where Bakers come in. Powerful hydraulic down-pressure on the blade bites deep into Italian lava, Algerian sand or South Pacific coral—gets full loads faster. Too, Bakers are as simple as they look—fewer parts—easier to maintain. No wonder the boys in the Seabees and the U. S. Engineers swear *by* them—not *at* them.

After monthly war quotas have been met, a few units are left for high priority requirements. If yours is a war job, you may be eligible. See your Baker, Allis-Chalmers dealer.

THE BAKER MFG. CO.
585 Stanford Avenue Springfield, Illinois

BULLDOZERS SNOW PLOWS BAKER CONSTRUCTION EQUIPMENT

American Engineers Adopt Bailey Bridge

Simple Easily Erected Steel Structure, Developed by the British, Already Proved Value with Fighting Forces

✦ THE Bailey Bridge, developed by Donald Coleman Bailey, of the British Ministry of Supply, as a new-type simple-to-construct military bridge, has been adopted wholeheartedly by American as well as British Army Engineers and has become a vital part of Allied military strategy, filling the gaps left by enemy demolition squads. It is reported that Mr. Bailey, who is now heralded in engineering circles as one of the outstanding bridge experts of all times, during a train journey jotted down on the back of an envelope this conception of a bridge suitable for use by the armed forces.

The use of the Bailey Bridge in combat in the Italian campaign already has received much publicity, but many of its features still are considered top secret. However, it is no secret that the bridge on many occasions aided Allied troops to advance where bridges had been blown up by the retreating enemy.

At an American Army Engineer bridge school in England, where troops are trained to erect the Bailey Bridge, Lt. John G. Snitzmier of Kansas City, Mo., one of the instructors, asserted, "It's the best bridge I've ever worked with, and as far as we know it's far better than anything the enemy has produced." He pointed out that its simplicity of construction—it is all held together by steel pins—combined with its strength and portability makes it "ideal for combat use". Lectures, discussions, training films, demonstrations and actual construction of the bridge, both the fixed and floating types, comprise the 10-day course at the school. The officers and non-commissioned officers taking the course then return to their various Engineer units, as instructors, to train the men in their outfits.

Design of Bridge

Meanwhile Mr. Bailey continues to work with the bridge at an experimental bridging establishment set up by the British Army, with Col. Geoffrey H. Hunt, M.C., serving as Chief Superintendent. Col. Hunt points out that the Bailey Bridge may be compared with a Mecanno or Erector set which contains pre-cut miniature girders for construction to suit a young boy's fancy.

Instead of girders, however, the Bailey Bridge employs specially constructed 10-foot steel panels as the basic structural pieces. These panels are placed either alongside each other, on top of one another, or both ways to strengthen the bridge. Each row of panels running the length of the bridge forms a truss, while panels placed on top of each other are called "stories". Thus a bridge with three trusses on either side and built three stories high is referred to simply as a "triple triple". Insofar as combat is concerned, the "triple triple" is the strongest version of the Bailey Bridge in use, although Mr. Bailey states that there are further possibilities. Within reasonable limits, the bridge may be made for use as a railroad span, or a "single single" can serve as a foot bridge. By varying the number of trusses and stories, the bridge can be erected to accommodate virtually any military road.

Erection

Launching the fixed type of Bailey Bridge as it is being built is a novel operation, accomplished by the use of "rocking rollers". The builders seek to maintain perfect balance of the bridge, shoving it out over the water on rollers at the rate of one bay as two are built. A bay is a 10-foot cross section of bridge, the length of one panel. A skeleton nose, the length of which is determined by the class of bridge, is built first and launched as part of the bridge. Then a start is made on the bridge proper. The Engineers work in crews, putting into place panels, transoms, braces, clamps, pins and other materials, and the bridge "rolls" across the gap until the skeleton nose touches the far-shore rollers.'

At this point, members of the bridge crew put their shoulders to the structure and shove until the "nose" has cleared the rollers, and the bridge itself is resting on them. If it is an uphill push, trucks are used. However, it is reported that it is a point of satis-

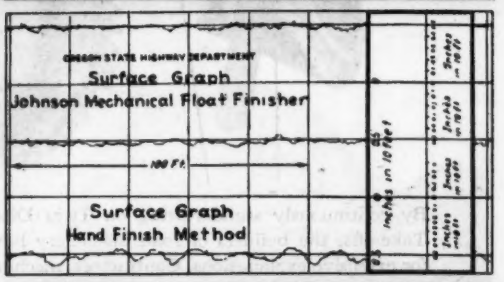
(*Concluded on page 44*)

British Combine Photo

A Bailey Bridge on the Fifth Army front in Italy.

JOHNSON *FLOAT* FINISHER

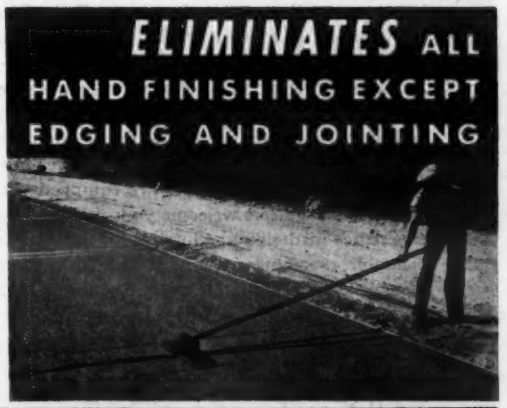
READY FOR EDGING and jointing! That's the way the Johnson *Float* Finisher works. It duplicates the action of the hand float or trowel. Has a troweling surface of more than 8000 square inches. It cuts off the high spots . . . fills in the voids . . . consolidates the mortar . . . and with mechanical efficiency leaves a finished surface with a variation of .05 inch, or less, in 10 feet—better than any state highway specification requirements.



You get speed, too, with the Johnson *Float* Finisher. Roy Houck, Oregon contractor, finished 3065 lineal feet in an 8-hour day. Mountain States Construction Company finished 6.37 miles of 22-foot highway in 33 days. These reports are not necessarily "top speed" for the Johnson *Float* Finisher—its capacity is far greater than present day requirements.

Write for catalog! You'll want to know about the easy adjustments to all highway curves from the vertical to the transverse spiral; the accurate control features; the motive power; the water supply tanks, and many other features.

MADSEN IRON WORKS
HUNTINGTON PARK, CALIFORNIA



TRANSITS and LEVELS
HEADQUARTERS for REPAIRS—any make

We will buy or trade in old Transits, Levels, Alidades, etc. Send instruments for valuation.

Write for new Catalog EC-99 of Engineering Instruments, Engineering Field Equipment and Drafting Room supplies.

WARREN-KNIGHT CO.
Mfrs. of Sterling Transits & Levels
136 N. 12th St., Philadelphia 7, Pa.

Dynamiting Ditches To Drain Iowa Roads

To deal with the havoc of the 1944 spring floods, many of Iowa's ninety-nine counties were faced with the necessity of quickly repairing damage, despite a shortage of man-power and equipment. Highways had to be kept open and war-vital crops had to be saved. Not only were roads and bridges washed out but inadequate roadside drainage allowed water to stand over the rights-of-way, and trapped water held thousands of acres of normally productive land useless. In some districts the emergency was so great that vast areas of water had to be drained off within 24 hours to save newly planted crops.

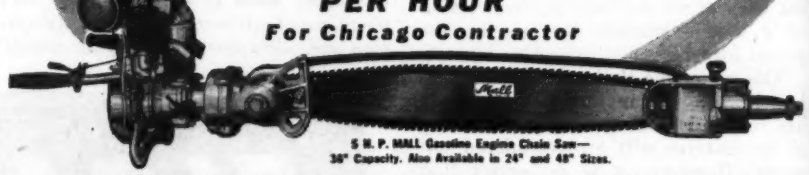
With the conditions such that heavy mechanical equipment could not be used, even were it available, county engineers sought dynamite experts of E. I. du Pont de Nemours & Co., who had been demonstrating ditch dynamiting to land owners. An instance of emergency service was the saving of most of a bridge which had been severely damaged by flood waters cutting a new channel. With ditching dynamite, a new channel 8 feet deep and 25 feet wide was blasted within a few hours and the county was able to start repairs immediately.

In Chickasaw County the blasting of a ditch 3 feet deep and 1½ miles long reclaimed 300 acres of good farm land in a matter of hours instead of weeks. Many of the counties had only one dragline which was usually hard pressed even without an emergency. By the end of June, flood-plagued Iowa had ordered about 150,000 pounds of ditching dynamite to clear the fields and roads for war crops and traffic.

Ditches are usually dynamited by the "propagation" method, which requires the placing of a number of specially formulated nitroglycerine dynamite sticks at depths and distances dictated by local conditions. One stick is set off by a cap exploded by conventional methods, and the others are exploded in quick, even succession by shock waves carried by the water in the soil. The ditch, regardless of length, is excavated almost instantaneously. If one picks up a handful of mud and can squeeze water through his fingers there is enough moisture for the "propagation".

The results of ditch digging by dynamite can be controlled closely. The depth of the ditches is constant and the debris is blown to either side, scattered evenly at a distance governed by wind conditions at the time, thus eliminating soil banks at the sides of the ditch.

Mall
REG. U.S. PAT. OFF.
CHAIN SAW
CUTS 60 18" PILES
PER HOUR
For Chicago Contractor



5 H. P. MALL Gasoline Engine Chain Saw—
36" Capacity. Also Available in 24" and 48" Sizes.

A 15-HOUR JOB FOR 2 CARPENTERS WITH A CROSS CUT SAW

Unskilled laborers can now cut and top piles and square heavy timbers to size with MALL Chain Saws after a few minutes instruction—at a surprisingly low cost. The 2-stroke cycle design gasoline engine starts easily . . . has stall-proof clutch and handle throttle, and uses little fuel. The 360-degree index permits sawing at any angle. Safety guard assures full protection. Pneumatic models also available. Electric, Gasoline Engine and Pneumatic sharpeners are available for sharpening chains in shop or field.

Write for literature and prices.

MALL TOOL COMPANY ★ 7743 South Chicago Ave., Chicago 19, Ill.

Mall PORTABLE POWER TOOLS

As Common AS A WRENCH

By continuously standardizing on Twin Disc Clutches and Power Take-offs, the builders of road machinery have eliminated the need for extensive explanations. Contractors, mechanics and operators have become so well acquainted with the Twin Disc name plate, that it is "as common as a wrench." They recognize that a Twin Disc Clutch means trouble-free performance . . . simple, one-point, hand adjustment . . . the easy replacement of worn out parts when needed. Further they know that repair parts are quickly available from 7 factory branches and 30 parts stations covering every important industrial area. This all adds up to more work done with fewer interruptions, less time off the job when your machines are equipped with Twin Disc Clutches. Twin Disc engineers welcome your new clutch problems; their 26-year experience in designing clutches for industry is your assurance of dependable recommendations. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

ABOUT A GRIFFIN WELLPOINT JOB—

• A Field Report from one who KNOWS!

Dear Sir:

Your letter and instruction sheets received and thank you kindly for your prompt reply.

As I am only one of the operators, I am not in any position to speak officially for the company.

From observation and inquiries from other operators, I find that these pumps are operating very satisfactorily

Two of these pumps have been on the same location for six months operating continuously and haven't given any trouble whatsoever. My experience with various types of pumps have proven to me that the Griffin Wellpoint is both efficient and economical.

We have a lot of water to pump and they are really doing the job O.K.

FOR SALE AND FOR RENT

MID-WEST	SOUTH
GRIFFIN EQUIPMENT CO., INC. 548 Indiana Street • Hammond 1662 HAMMOND, INDIANA	GRIFFIN ENGINEERING CORP. 633 N. Myrtle Ave. • Jacksonville 5-4516 JACKSONVILLE, 4, FLA.

MAIN OFFICE: 881 EAST 141st STREET, NEW YORK 54, N. Y.

GRIFFIN WELLPOINT CORPORATION

C. & E. M. Photo

Discharging a load of hot-mix into the hopper of the Adnun Black-Top Paver on a section of the Montauk Highway on the Long Island south shore.

Hot-Mix Resurfacing On Long Island Route

(*Continued from page 7*)

flat side of the plank are slots 1 inch wide x 1 inch deep running the width of the plank and spaced at 3-inch intervals. Three or four times a day, and at the end of the day's run, the screed was let down on this cleaner and operated back and forth, as against a file, to remove the accumulated and hardened material.

Two split rollers located behind the screed on the paver help reduce surface irregularities. The black-top surface was immediately rolled to a 2-inch thickness by a Buffalo-Springfield 10-ton tandem roller which was rented by the Division of Highways. The black-top in back of the paver was kept free of traffic until the surface had been compacted by rolling and was sufficiently cooled and hardened to withstand traffic. Pavement laid in the afternoon was generally opened for use the following morning.

The only other equipment used was a 1½-ton Ford truck with rack body for general utility, carrying gasoline drums, shovels, rakes, etc.

Maintenance Employees Used

Twelve men, all regular highway maintenance employees, one of whom was a foreman, were required at the paver. Two acted as traffic flagmen at opposite ends of the job. The paver operator made the original adjustment of the screed by means of a hydraulic lift whereby the crown could be applied. Two others, one on each side of the screed, made the final height adjustments to suit the varying conditions of the roadbed. The hopper was tended by two men with shovels who kept the material flowing evenly. The remaining four men were used for raking, filling in, widening, if necessary, and general hand finishing. Their rakes and shovels were kept clean of the hot-mix by holding them in a flaming can of kerosene which burned steadily along the roadside near the paver. Two gallons of kerosene, to which a little oil was added, would burn for 2 or 3 hours. About 10 gallons of kerosene a day was used for this purpose.

The Black-Top Batch

This asphaltic-concrete mixture is a combination of mineral aggregate, mineral filler, and bituminous material in the following composition:

Broken stone (from ¼ to ½-inch)	20 per cent
Screenings or sand (passing ¼-inch, retained on ⅛-inch)	35 per cent
Screenings or sand (passing ⅛-inch, retained on 80-mesh)	35 per cent
Screenings or sand (passing 80-mesh)	4 per cent
Bituminous material	6 per cent

The 1-ton batch of asphaltic concrete by weight consisted of:

Stone (½-inch and smaller)	400 pounds
Gravel grits (passing ⅜-inch screen)	800 pounds
Sand	680 pounds
Bituminous material	120 pounds
Total	2,000 pounds

The bituminous material was composed of asphalt paving cement of a penetration between 85 and 100.

The Hot-Mix Plant

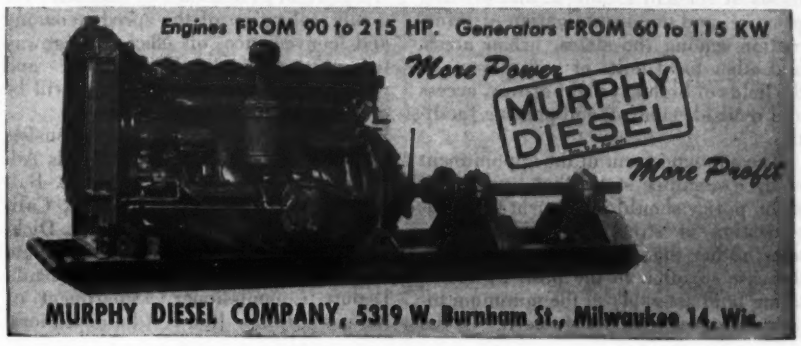
The hot-mix plant in Islip operates with the asphalt steam dispersion process, a patented process included in New York State specifications. The aggregate, weighed as specified for each size, enters the pugmill at temperatures between 130 and 200 degrees F, where it is mixed dry for at least 15 seconds before the introduction of the bituminous material. The asphalt is admitted into a steam chamber at temperatures of 180 to 225 degrees F under a steam pressure of 50 to 80 pounds. Steam is next fed through pipes to heat and agitate the asphalt. The mixing period, after the bituminous material enters the pugmill, is continued for 45 to 60 seconds.

A total of 3,000 tons of hot-mix surfacing was laid on this project, which was begun on July 6, 1944, and finished within 15 working days. An average day's run of the 2-inch course was 500 feet of full 36-foot-width paving. The cost of the material delivered to the paver was $19,500 or $6.50 per ton, while labor, including rental of the roller, was $3,500.

Other black-top paving jobs in the program for eastern Long Island this year are at Kings Park, Quogue, Westhampton and Speonk, where similar disintegration of old concrete pavements has been encountered. At these locations the highway is being widened from 20 to 24 feet, using broken stone with bituminous penetration for the widening strips.

Personnel

Highway General Maintenance Foreman John J. Carrigan was in charge of the highway maintenance crew working on the Sayville project under the supervision of Edward T. Conroy, County Assistant for the Division of Highways in Suffolk County. The work was directed by Joseph J. Darcy, District Engineer, District 10, New York State Division of Highways.


Engines FROM 90 to 215 HP. Generators FROM 60 to 115 KW
More Power
MURPHY DIESEL
More Profit
MURPHY DIESEL COMPANY, 5319 W. Burnham St., Milwaukee 14, Wis.

TRENCHLINER

DIGGING TRENCHES...

. . . with the Parsons improved 250 Trenchliner gives you the advantage of full crawler traction for solid footing . . . multiple travel and digging speeds for easy or tough digging . . . long and wide crawlers . . . low ground pressure, approximately 7 pounds per square inch . . . digging depth of 12'-6" . . . digging width 16" to 42" . . . shiftable, telescopic boom . . . power shift arc conveyor. All of these and many more have proven the operating economy, high production ability and low maintenance cost records. Now is the time to prepare for economical trenching . . . with a modern Parsons Trenchliner.

THE PARSONS COMPANY
Newton, Iowa

Parsons Model 250

TRENCHING EQUIPMENT

PARSONS

Right-of-Way Group Of Research Board

A new committee, to be known as the Committee on Acquisition and Legal Control of Right-of-Way, Adjacent Areas, and Parking Facilities, has been created in the Highway Research Board's Department of Economics, Finance, and Administration. The functions of the committee will include the initiation and execution of original research, the synthesis of efficient technique and existing practice, and the dissemination of information among the states, urban areas, and other local units of government, in the fields of highway right-of-way, access and roadside control, and parking facilities.

The announcement of the appointment of the committee states that land-acquisition policy should implement the modernization of street and highway systems, rather than impede it as has been the case so often in the past, by facilitating land assembly at the minimum total cost, rapidly and adequately. To the end that large numbers of vehicles may travel safely with a minimum of obstruction and with a maximum of speed, highway authorities are beginning to think in terms of controlling highway access and effectively controlling the adjacent area development that is seriously detracting from the efficiency of the road system. Off-street parking facilities, particularly in the central areas of cities, should be recognized as completing the provision for overall service from origin to destination, necessary for a full realization of the speed, economy and convenience of efficient highway transport. The legal, economic and policy aspects of these problems will be investigated by this committee.

The new committee at present consists of: David R. Levin, Public Roads Administration, Chairman; Frank C. Balfour, Chief Right-of-Way Agent, California Division of Highways; J. L. Dickson, Road Design Engineer, Texas State Highway Department; H. S. Fairbank, Deputy Commissioner, Department of Research, Public Roads Administration; H. E. Hilts, Deputy Commissioner, Department of Design, Public Roads Administration; L. W. Kern, Right-of-Way Engineer, Maryland State Roads Commission; Theodore M. Matson, Director, Bureau for Street Traffic Research, Yale University; H. J. Neale, Landscape Engineer, Virginia Department of Highways; Flavel Shurtleff, Counsel, American Planning and Civic Association; and George S. Wehrwein, Professor, Land Economics, University of Wisconsin.

Belt-Conveyor Care

Bulletin No. 7 in the series "Rubber Conservation Facts", issued by the Goodall Rubber Co., Inc., 2 So. 36th St., Philadelphia 4, Pa., deals with the care of rubber belt conveyors. Pointing out that the care of a rubber belt conveyor can be better understood if the fundamental characteristics and functions of the two component parts, cotton fabric and rubber, are kept in mind, this bulletin discusses these two parts and what each requires in the way of care to keep belt conveyors in service.

Copies of this Bulletin No. 7, which will help you to conserve your present belt-conveyor equipment, may be secured direct from the company. Just mention this item.

HIGH EARLY STRENGTH
WITH
BUILT-IN CURING

EARLY STRENGTH THAT LASTS

. . . that's the real value of calcium chloride in concrete. Calcium chloride not only doubles the early strengths of concrete, but all tests show greater strengths at all ages tested over many years. Every particle of cement responds to this integral uniform curing reaction.

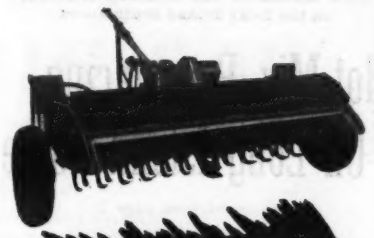
This simplest and most economical method of curing obviates the necessity of many inspections, and much equipment, material and labor are saved. The economies include the ability to handle a job with a much smaller investment in forms as they may be removed earlier for continued re-use. Calcium chloride also permits quicker, faster finishing, makes more orderly scheduling possible.

Many of these advantages, so very desirable in cold weather concreting, help speed the work the whole year 'round. Write for Bulletin 28, "Early Strength Concrete." It will be sent on request. Calcium Chloride Association, 4145 Penobscot Building, Detroit 26, Michigan.

FOR YEAR-'ROUND CONCRETING

USE CALCIUM CHLORIDE IN-THE-MIX

ARIENS AGGMIXER



FOR MIXED IN PLACE CONSTRUCTION

Operates in connection with other general purpose road equipment, Ariens Aggmixer does a thorough job of pulverizing and mixing—wet or dry—rapidly and economically with whatever aggregates and binder are used, such as all type of bitumens, cements, clays, chlorides, etc. The swirling, chopping action of the tines does the job . . . easy and safe to operate . . . adjustable to any tractor . . . hydraulic adjustment for depth is simple and positive . . . made in four sizes, with normal cutting widths 4', 5', 6', and 7' . . . complete details upon request.

A THOROUGH JOB OF PULVERIZING AND MIXING

ORDNANCE 8 UNITED STATES ARMY

ARIENS COMPANY
BRILLION, WISCONSIN

Notice to Contractors: Commonwealth of Massachusetts, Department of Public Works, sealed bids or proposals will be received by the Department of Public Works at its office, 4th Floor, 100 Nashua Street, Boston, Massachusetts, until 12 o'clock noon, Tuesday, September 26, 1944, and at that place and time will be publicly opened and read. The work to be done is the placing of approximately 10,000,000 cubic yards of hydraulic filling for Embankments "A" and "B" at the General Edward Lawrence Logan Airport, East Boston. Proposal guaranty shall consist of a certified check for $75,000, payable to the order of the Department of Public Works, or other security satisfactory to the Department. A bid bond will not be accepted. The successful bidder will be required to furnish a bond for the faithful performance of the contract in such sum as may be fixed by the Department. The surety may be a surety company or securities satisfactory to the Department. Attention is called to the minimum rate of wages to be paid on the work as determined by the Commissioner of Labor and Industries under the provisions of Chapter 401, of the Acts of 1935. Complete information may be obtained from the office of the Department. Right reserved to waive any informality in or to reject any or all proposals. A proposal which includes for any item a bid that is abnormally low or high may be rejected as unbalanced. By: Herman A. MacDonald, Commissioner of Public Works, August 26, 1944.

Texas Access Road Paved with Concrete

Holland Page of Austin Lays Concrete Surface with Black-Oxide Center Stripe; All Aggregates Stockpiled

✦ A CONTRACT covering the construction of 1.7 miles of 9-7-9-inch concrete pavement 20 feet wide on a military access road near Harlingen was awarded by the Texas Highway Department to Holland Page, Austin, Texas, in the spring of 1944, and the work was completed before hot weather. The new highway provides improved access to an Army airfield.

Proportioning Plant

Because of the limited track space available, as well as the uncertainty of deliveries, it was considered advisable to stockpile all aggregates before paving commenced. Gravel ranging in size from 2 inches to No. 4 was shipped from the Victoria plant of the Fordyce Gravel Co., while sand originated at the Mathis plant, belonging to the same company, both being delivered to Harlingen. This material was unloaded from the cars by a Link-Belt Speeder crane with a ¾-cubic-yard Williams clamshell bucket on a 55-foot boom and a Northwest crane with a 1¼-cubic-yard Blaw-Knox bucket on a 45-foot boom, and stockpiled, with gravel on one side and sand on the other of the Blaw-Knox two-compartment steel bin equipped with weigh batchers. During paving operations, both cranes were used for batching, because of the necessity of rehandling material from the extensive stockpiles.

Cement in cloth sacks was shipped to Harlingen from the Trinity Portland Cement Co.'s Houston plant, and unloaded directly from cars to batch trucks by eight men. After receiving its load of cement, each truck drove past an elevated platform, situated approximately 100 feet from the car door, where two men emptied the cement from the sacks, throwing the empty sacks to two men on the ground, who shook and bundled them without saving the shakings.

Twelve 2-batch and one 1-batch Ford trucks were used in the batch haul, which averaged 1½ miles of reasonably good dirt road and city streets.

A Graco Convoy Luber mounted on a Chevrolet truck was used for the field lubrication of all machinery at both plant and road.

Grading and Form Setting

The moderate amount of rough grade was compacted by sheepsfoot rollers to a density of 95 per cent Proctor, with city water, hauled in 1,000-gallon tank trucks, used for sprinkling. Before form setting, the grade was closely shaped to cross section by a Caterpillar No. 12 motor grader, after which a crew of fourteen men set the 9 x 8-inch Blaw-Knox steel forms, driving the pins by hand. Approximately 4,000 feet of forms were used.

After the forms were set, more careful checking of the fine grade was possible and excessively high dirt was windrowed by the same Caterpillar motor grader, loaded and hauled out by a 7-cubic-yard LeTourneau scraper pulled by an International TD-18 tractor. An attempt was made to leave not over ½ inch of the heavy cohesive material forming the grade to be handled by the Flynn Surgrader, which completed the fine grading. A Caterpillar D7 tractor, equipped with a LeTourneau bulldozer, assisted in the disposal and shaping of the excess dirt removed from between the forms.

After the fine grading operation was completed, a form aligner, with two helpers, handled the checking and realigning of the forms ahead of concrete placement. This same crew set the ¾-inch redwood joints, carrying ¾ x 21-inch asphalt-coated dowels on 14-inch centers, at intervals of 120 feet.

Pouring and Finishing

Water for the concrete was delivered from the mains of the city of Harlingen by two 1,000-gallon tanks, mounted on Ford trucks. A Rex Speed Prime pump with 3-inch suction and the discharge bushed to 1½ inches in diameter was mounted on a three-wheel frame, pulled behind the water truck, and used to transfer water from tank trucks to paver. A third 1,000-gallon tank truck was used to sprinkle the subgrade just ahead of the paving operation.

One man dumped the batches into the skip of the Rex 34-E double-drum paver which was operated on the shoulder, outside the form line. Mixing of the batch, which consisted of 1,806 pounds of sand, 3,305 pounds of gravel, and 7½ sacks of cement, producing 40.5 cubic feet of mixed concrete, in which the water content of 6 gallons per sack of cement provided an average 1½-inch slump, was continued for 17 seconds in the first drum, and 42 seconds in the second drum. Two puddlers shoveled the discharge from the paver into shape to be handled by the Blaw-Knox finishing machine equipped with two screeds and a tamper.

One man standing on a bridge on the front of the Flex-Plane machine which followed the finisher placed ½ x 36-inch tie rods across the center strip, each 30 inches, pushing them into the fresh con-

(*Concluded on page 63*)

When the War Ends—

We will re-solicit your orders to make rapid, large-scale Aerial Surveys of

Highways, rivers, railroads, rights of ways, etc.

Until then we are engaged wholly on work for the Government.

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- LESS OPERATING COST
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Thor "AIR ECONOMY" FIGURED IN YOUR POST-WAR EQUIPMENT PLANS WILL SAVE YOU TIME, CUT COSTS . . . GET TOMORROW'S JOBS STARTED FAST AND MOVING!

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Thor Paving Breakers, light, medium and heavy duty models, are equipped with the same "measured air" type of short-travel tubular valve as Thor Rock Drills.

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Air that powers the stroke of Thor Clay and Trench Diggers is measured by a new short-travel cylinder "rocker" valve which provides *perfect sealing and control* of required pressure for driving the piston.

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A short-travel tubular valve, heat-treated for durability and precision-ground for perfect fit, "measures" air that powers all three types of Thor Rock Drills—Sinkers, Drifters and Stopers.

This precise control of air consumption provides steady power and smoothness in the *automatic rotation* of these drills. *Controlled air* driving the piston gives the steel on the working end maximum forward and rotative action . . . assures fast drilling speed!

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Short-travel valve action is the real secret behind Thor "measured air" economy.

The shorter the travel, the more *positive the action* of the valve in admitting to the tool only the required amount of air—in instantly sealing the inlet against excess air.

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Short-travel valve action powers each stroke of the tool with the same quantity of air—providing *smooth, uniform operation.* Elimination of excess air keeps out of the channel the overload of power that staggers the stroke and causes vibration.

For particulars about *automatic rotation . . . cushioned action . . . automatic lubrication . . . exclusive retainer design,* and many other features of Thor Contractors' Air Tools, write today for Catalog No. 42-A.

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THOR ROCK DRILLS | THOR DRIFTER ROCK DRILLS | THOR STOPER ROCK DRILLS | THOR PAVING BREAKERS | THOR CLAY AND TRENCH DIGGERS | THOR BACKFILL TAMPERS | THOR SUMP PUMPS

No Political Posters Along Your Highways

Now that primary elections are at their height and state and national political campaigns are getting under way, there is a tendency for ambitious candidates to plaster telegraph poles and fences along the highways with their likenesses and their political appeals. These posters are no more decorative along our roadsides than are billboards and other commercial advertising, and are just as out-of-place.

The Missouri State Highway Commission, according to its employee publication "Highway News", issued an appeal recently to members of all political parties, individual candidates, and business firms, to keep Missouri highway rights-of-way free from campaign posters and advertising signs. All maintenance patrols in the state have been readvised of the long-standing regulation of the Department concerning the exclusion of all advertising, including political posters, from the highway rights-of-way, under authority of Sec. 8755 R. S. Mo., 1939. They have been instructed to remove all posters impartially.

While road workers have standing instructions to remove posters and unauthorized signs as soon as they appear in Missouri, much time and expense to the state would be saved if party workers, candidates and advertising men would refrain from cluttering up the roadside with placards and signs.

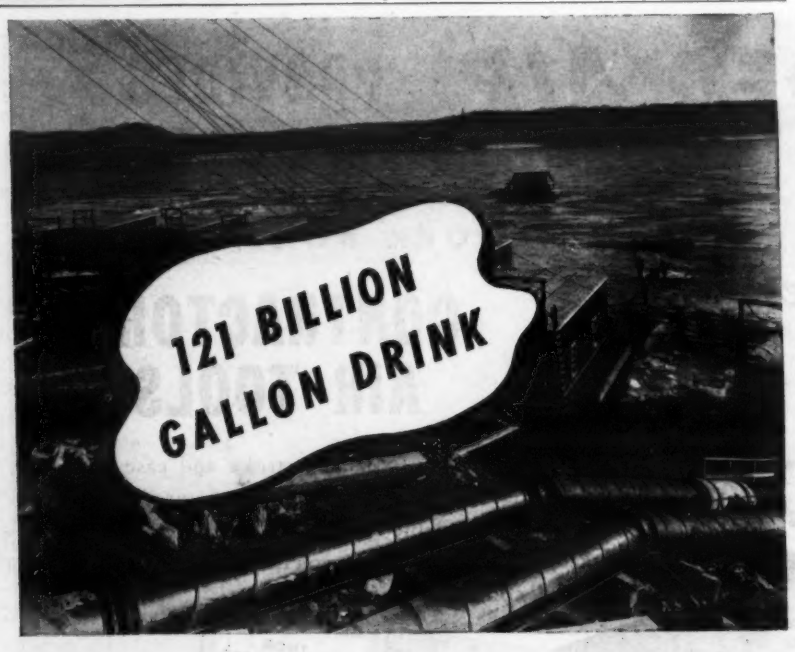
In any state, the routine maintenance of highways demands the full time of the patrolmen and if they are required to spend their time removing advertising signs, unsightly and otherwise, along hundreds of thousands of miles of highway systems, much time is lost.

The cluttering of our highway roadsides with placards, posters, and advertising signs not only contributes to traffic hazards, but also mars the beauty of the roadside scenes which highway workers in general are constantly striving to maintain for the enjoyment of the citizens as well as visitors to the various states.

A High-Speed Maintainer

The latest bulletin issued by Contractors Machinery Co., Inc., Batavia, N. Y., describes the Trojan Utility Speed Patrol, Model PM-10-44. This patrol weighs 10,300 pounds and has a 40-brake-horsepower drive. It carries a 10-foot blade and scarifier and operates in five forward speeds of 2½ to 16 mph and 3⅛ mph in reverse.

Copies of this folder will be sent by the manufacturer on request to those mentioning this item.



NAYLOR PIPE GULPS 2,000,000 TONS OF WATER DAILY TO UNCOVER IRON DEPOSITS UNDER CANADIAN LAKE

Here's a dramatic demonstration of light-weight pipe performance on a tough assignment.

In the project of de-watering Steep Rock Lake, more than a mile of large diameter Naylor Lockseam Spiralweld Pipe is literally carrying away the lake at the rate of 7 inches a day. In all, this distinctive light-weight pipe must handle 121 billion gallons of water before the deposits of iron ore can be tapped.

Naylor's exclusive structural advantages enable this light-weight pipe to make light work of gulping 2 million tons of water a day.

That's why Naylor is specified for such services as dredging, hydraulic sluicing, de-watering, ventilating, exhaust and intake and other applications of high and low pressure air and water lines.

Only NAYLOR PIPE Combines All These Advantages

- Always accurate in diameter.
- Concentric ends match correctly.
- Easier to install.
- Holds true cylindrical form.
- Stays tight and leakproof.
- Stronger—safer.
- Handles jobs normally requiring heavier-wall pipe.
- High salvage value.
- Light weight saves steel.
- Cuts maintenance costs.
- Saves money.

Sizes: 4" to 30" in diameter—all types of fittings, connections and fabrications.

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SPIRALWELD PIPE

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To move the maximum water in the minimum time, give it a whirl with a Self-Priming Centrifugal Pump. Centrifugal Reaction gives these pumps high-speed and high-capacity!

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Remember, for high-speed, high-capacity dewatering . . . use a Self-Priming Centrifugal Pump. For low-operating, low-maintenance cost . . . insist on a Novo Self-Sealing Self-Primer. Give it a whirl, you won't regret it.

Let us send you complete information about the complete line of Novo Self-Priming Centrifugal Pumps (1½" to 6").

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NOVO ENGINE COMPANY
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GREATER Digability to speed your operations!

Digability is a popular feature of the Hendrix LIGHTWEIGHT whether it is dry or wet digging that must be done. In performance and lasting service, the LIGHTWEIGHT is today "delivering the goods" on construction works in this country and where our military forces are building more installations to speed Victory.

Why handicap your operations? Gain the advantage of the greater digability of a LIGHTWEIGHT by employing one on your job.

With 20% to 40% lighter weight, all-welded construction, 10% to 40% manganese steel chains and fittings, it's easy to see why the LIGHTWEIGHT gets fuller payloads every trip . . . is winning more favor with dragline operators.

DE SOTO FOUNDRY, INC.
MANSFIELD, LOUISIANA

Three types: light, medium and heavy duty from ⅜ to 20 cubic yards, with or without perforations.

HENDRIX Lightweight DRAGLINE BUCKETS

Use of Air Photos For Highway Location

Outline of the Principles Of Aerial Photography and Photogrammetry with Some Discrepancies Explained

By FRANK E. BOSLAND, Civil Engineer, Design Department, Tennessee Valley Authority

✦ HIGHWAY location in rugged or wooded terrain is a difficult and tedious operation when no maps of the area are available, unless one is intimately familiar with the surrounding terrain. Since this is not usually the case, we have to rely on such maps as are available to show conditions as they exist on the ground. If the area is wooded, hilly, or swampy, extensive field work would be required if every possible route were surveyed. The details shown on available maps determine the facility of making highway relocations.

Aerial photographs present an excellent opportunity to observe all the details on the ground. All the possible routes may be studied in the office, field exploration kept to a minimum, and the locating engineer can have more confidence in his work. Aerial photographs are the best maps that can be obtained for planning projects of this kind. They also give the office man, who does not have the opportunity to get out in the field, a feeling of dealing with something concrete that working with line drawings cannot accomplish. They stimulate interest in location work and also give a feeling of security to responsible locaters that they have exhausted all possibilities. Under pressure of accelerated schedules and working in strange territory, it is sometimes impossible to determine all possible routes on the ground. Even then one is not sure that other possibilities do not exist unless he can study the area on photographs.

Highway engineers, in general, have been slow in using aerial photographs for reconnaissance, location, and design. This is due, perhaps, to the following reasons:

1. Photogrammetry is a specialized science which is relatively new and involves expensive equipment. Highway engineers feel, and rightly so, that they cannot keep up with all new developments and then use this knowledge only once a year.

2. Few men realize that over 75 per cent of the United States has already been flown and that pictures are available.

3. Very little information has been published on the use of photographs for men not versed in the intricacies of photogrammetry.

Making the Photos

Aerial photographing can be done only on clear, cloudless days during certain seasons of the year. Also the area must be flown during certain hours of the day when the sun is high, which results in a minimum of disturbances from shadows.

The area is flown in strips. Each picture of the strip overlaps the preceding one by approximately 60 per cent, and each strip overlaps the adjacent strip by about 35 per cent. This overlap is controlled by the photographer, who directs the pilot. Range indicators in the camera enable him to see the area covered by each picture. The plane continues back and forth until the required area is photographed.

The scale of the photograph is directly proportional to the focal length of the camera and the altitude of the plane. For example, if the focal length is 6 inches and the height equal to 10,000 feet, the scale of the photograph will be 1 inch equals 1,665 feet. Thus the scale of the photographs is determined prior to leaving the ground by computing the altitude required for the camera.

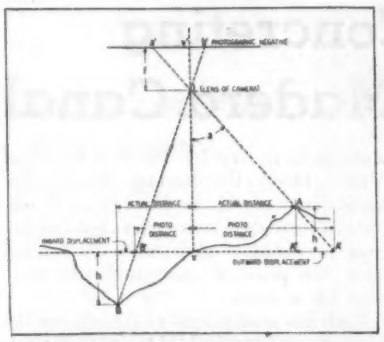

Figure 1. The actual distance of a point from the center of an aerial photograph is distorted by the elevation of the ground.

The most satisfactory scale to use for highway work is about 1 in 15,000 or a scale of 1 inch equals 1,250 feet. Larger scales limit the area possible to view under the stereoscope, thereby making it difficult to obtain an overall perspective of the project. Smaller scales make it hard to recognize details. It becomes exceptionally difficult to determine the small drainage areas when the scale is smaller than 1 in 24,000 or 2,000 feet to the inch.

Correcting Discrepancies

Photogrammetry is the science of preparing maps, to scale, from aerial photographs. Figures 1 and 2 show some of the elementary fundamentals of this subject. These figures are presented not to explain how to make maps, but to bring out some of the discrepancies in aerial photographs. Being aware of these differences, and recognizing them on the photos, allows us to use the pictures for highway reconnaissance, location, and design with as much confidence as if they were to accurate scale throughout.

One of the most disconcerting features on first matching adjacent photos is the inability to match all points on the overlapping prints. Figure 1 shows displacement due to differences in elevation. Points of different elevation are

(*Continued on page* 46)

PRESSURE · VIBRATION · POWER TROWEL

1. Disintegrated concrete on highway Bridge.

2. Vibrating new cement - sand mortar surface with Power Trowel.

3. Completed work. Bridge restored to original strength, form and beauty.

A NEW ADDITION TO THE PRESSURE-VIBRATION LINE

Of incredible lightness and power for its size. Built of light-weight alloys, powered by an air turbine rotor built into the base, attaining 10,000 vibrations per minute, a new hand-operated Power Trowel, now makes possible the restoration of disintegrated concrete *(with concrete)* on floors, roads, bridge decks, abutments, buildings.

The combination of pressure and vibration forms a complete bond between the old structure and the new concrete, providing a new finished concrete surface of extreme density and hardness.

Literature covering the complete line of Pressure-Vibrators will be available soon. Write for your copy.

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It's easier to lift, lower, push or pull the Simplex Way!

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for every construction purpose

Awarded the Gold Medal for Safety

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Templeton, Kenly & Co., Chicago 44, Ill.

Grading and Concreting On Section of Madera Canal

(*Continued from page 2*)

the entire section to be excavated was drilled and shot in order that there might be no delay of the heavy excavating equipment. A Gardner-Denver 260-cfm compressor powered by a Caterpillar diesel engine and a Schramm 110-cfm compressor furnished air for the Cleveland and Gardner-Denver wagon drills. Hercules 40 per cent gelatin dynamite was used for blasting. A diesel-powered Bucyrus-Monighan walking dragline with a 100-foot boom and 5-cubic-yard bucket handled the major portion of the canal excavation.

The planned procedure of shooting the canal section so thoroughly that all excavation could be completed at one time did not prove to be entirely successful and in some cases it was necessary to do secondary drilling and blasting. An Ingersoll-Rand 160-cfm compressor with Ingersoll-Rand jackhammers, or wagon drills if needed, performed this additional work and the excavation was finished by a Northwest dragline with a 1½-yard Page bucket.

Miscellaneous Structures

Included in the contract was the construction of seven 2-lane farm bridges of untreated timber for an H-10 loading, crossing the canal; a highway bridge of concrete deck-girder construction, with two 35-foot spans; eight concrete box culverts from 2.5 x 2.5 feet to 5.0 x 5.0 feet in size, to carry drainage water under the canal; twelve concrete drainage inlet structures admitting surface drainage into the canal; a special structure combining turnout, weir and culvert; a chute 313 feet long where the elevation of the canal could be advantageously lowered; an over-chute to carry storm water over the canal; and the siphon previously mentioned to carry the canal water under Hildreth Creek.

The area of excavation for these structures was dewatered by farm drain tile placed in gravel-filled trenches below grade, discharging into sumps from which the water was removed by a Marlow pump.

Sectional forms of plywood on 2 x 4-inch studs at 16-inch centers were used for most structures, with double 2 x 4 wales held in line by Twistyes at 3-foot centers. Due to the shortage of steel reinforcing materials, the Bureau of Reclamation furnished some plain reinforcing steel in place of deformed reinforcing bars, and pre-cast concrete blocks were used for spacers.

Both fine and coarse aggregate for the concrete was trucked 20 miles to the job from the Stewart & Nuss plant at Fresno, with the coarse aggregate in two sizes of No. 4 to ¾ inch and ¾ inch to 1½ inches. A special cement manufactured to Bureau of Reclamation specifications by the Monolith Portland Cement Co. was furnished in paper sacks by the Bureau at Friant and unloaded and hauled by the contractor.

Aggregates were weighed in rubber-tired wheelbarrows on a Winslow Junior scale and mixed for 1½ minutes in a Jaeger 14-S mixer for which water was hauled in a 600-gallon truck-mounted tank. The concrete was distributed by two-wheel rubber-tired concrete carts over sectional runways 3 feet wide made of 1 x 6 boards spaced on approximately 8-inch centers on three 2 x 4 stringers. Master electric vibrators with a portable generator were used in the placing of all concrete.

All curing was done by Hunt Process compound, white-pigmented for surfaces which might be exposed to the direct rays of the sun and clear compound on shaded surfaces.

The Hildreth Creek Siphon

After the waters of Hildreth Creek had been diverted by the construction of a temporary channel, the excavation for the siphon was done by scrapers and finished by hand. The design provided for an inverted siphon with a circular barrel of 12.5 feet inside diameter and an overall enclosed length of 432 feet, including the transition sections from a square to round cross section. Concrete inlet and outlet sections added 112 feet to the total length of the structure. The walls are 13 inches thick on the enclosed section, reinforced with ½ and ⅝-inch circular hoops in both faces, ⅞ and 1-inch segmental bars, and ½-inch longitudinal bars. There is a designed fall of 1.25 feet from end to end of the siphon, with the low point of the invert 16.73 feet below a straight grade joining the end elevations.

Expansion joints were installed at 25-foot intervals, each of which includes a 3/16 x 8-inch wrought-iron water stop coated with a Bentonite-asphalt-emulsion compound and dowelled with ⅝ x 18-inch rods staggered on alternate sides of the stop and also coated to prevent bond.

To expedite construction, a special form and support were designed by Fred Marburg, an employee of the subcontractor, and three of these units were built and used, each sufficient for a 25-

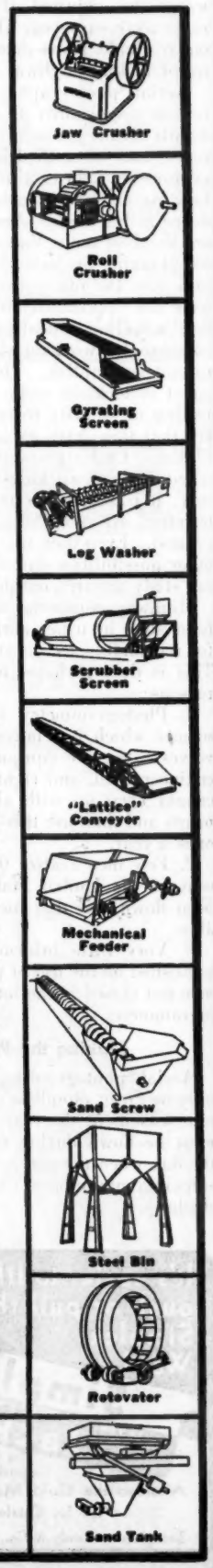
(*Concluded on next page*)

1,000 TONS per DAY with Universal Standard 6 Unit Plant

Channel Frame Return Conveyor
4' x 8' 3-deck Gyrating Screen
36" x 8' Apron Feeder
20" x 36" Jaw Crusher
40" x 24" Roll Crusher
Lattice Frame Conveyor

Over 100 tons per hour, 1,000 tons per day—day after day—of ballast, mostly 1½" and 1", are being turned out at minimum cost for the Burlington Railroad at Wyalusing, Wisc. This plant, one of a number owned by E. C. Schroeder of McGregor, Iowa, consists of 6 standard units selected as most suitable for this railside quarry. Timber was used wherever possible to conserve metal. Output is up to the expectations of all concerned.

This plant, made up of 6 "packaged" units and arranged to provide a minimum of handling, includes: a 20" x 36" roller bearing primary jaw crusher of Universal's exclusive light-strong Streamlined design; a 40" x 24" roller bearing star gear roll crusher for secondary reduction; 4' x 8' three deck gyrating screen; a 36" x 8' apron feeder with bar grizzly and by-pass (to by-pass fines around primary crusher); a 24" x 108' lattice frame conveyor from primary crusher to screen; and an 18" x 44' channel frame return conveyor. This is another case where soundly engineered standard units of the proper size selected from Universal's complete line were brought together to form an efficient, profitable plant. Probably we can do the same for you.



UNIVERSAL ENGINEERING CORPORATION

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TARPAULINS WIND BREAKS

Fultex waterproof covers give economical protection—one of the most widely used, serviceable covers on the market. Recommended for heavy duty and long wear at low cost.

Quick delivery from stock on standard size covers.

FULTON BAG & COTTON MILLS

Manufacturers since 1870

Atlanta, St. Louis, Dallas, Minneapolis, New York, New Orleans, Kansas City, Kan.

Special Forms Used For Hildreth Siphon

(Continued from preceding page)

foot section of barrel between expansion joints. By using the three units, each started in a separate section of the siphon, it was hoped that, after all three had been set and poured, the specified 750-pound compressive strength, necessary before forms could be removed, would be attained in time to permit resetting and a sectional pour every second day.

The most distinctive feature of the form was its support, a device resembling a carpenter's sawhorse except that it was 28 feet long, approximately 8 feet high, and built of steel. The horizontal member was a 16-inch I-beam with two under-truss rods ¾ inch in diameter. The supporting end legs were made of 4-inch pipe with flat plate shoes and were attached to the ends of the I-beam by a curved strap permitting adjustment of the angle they made with the vertical. This angle was adjusted by brace rods of 3-inch pipe with heavy turnbuckles, permitting considerable change in length with resulting raising or lowering of the position of the I-beam. A-frames of 4 x 6-inch lumber were set vertically at 18-inch centers with their cross pieces supported by the steel I-beam and 2 x 4 braces extending radially from them to the 2 x 8-inch ribs cut to the proper radius. On these ribs were nailed 4-inch center-matched lumber laid on the longitudinal axis of the 25-foot form section. Two sections of form, each covering approximately 165 degrees of the inside arc, were butted immediately above the apex of the A-frame. The remaining 30 degrees of arc in the bottom was covered by two more sections of form, similarly constructed with their butted ribs cut on a diagonal to facilitate dismantling. The four sections of form, when properly assembled, made a cylindrical inside form of 12.5-foot radius supported on the steel "sawhorse" frame which could be raised or lowered at either end or moved along the axis of the siphon as desired.

The outside form, which was vertical on the bottom half of the siphon and concentric with and 13 inches from the inner form on the top half, was set independently of the inner form and braced to the banks of the excavation. Numerous openings were left in the outside form through which tremies could be inserted for the placing of concrete in the lower part of the siphon and were closed by carpenters as the concrete rose to their level.

Concrete having a cement content of 1.5 barrels per cubic yard was used for the siphon barrel. The lower part was mixed to a 6-inch slump and only small gravel used, to facilitate placing in the difficult under-side. The slump was decreased and larger-sized gravel added to the mix in the more accessible top half. Approximately 45 cubic yards of concrete went into each 25-foot section and the same equipment was used as for other concrete structures included in the contract, with the addition of a Badger crawler crane powered by an International Harvester engine for handling forms, and a Caterpillar Twenty tractor.

Major Quantities and Personnel

Principal quantities in this contract included the following:

Common excavation	597,000 cu. yds.
Rock excavation	119,000 cu. yds.
Excavation for core banks (selected material)	65,000 cu. yds.
Structural excavation (common)	23,000 cu. yds.
Structural excavation (rock)	5,800 cu. yds.
Backfill	12,000 cu. yds.
Concrete in structures	3,270 cu. yds.
Reinforcing bars	350,000 lbs.

The contract for the construction of this 11-mile section of the Madera Canal in California was awarded to Larsen Bros. and Harms Bros., Sacramento, Calif., by the Bureau of Reclamation on August 10, 1943, for $448,668.75. The section from Station 452 to 740 was allowed 250 calendar days for completion, with an additional 50 calendar days allowed for the completion of the contract to Station 1039. A subcontract for the concrete structures was awarded to L. H. Hansen & Sons of Fresno, Calif., by the general contractor.

Emmet Miles was Superintendent for the general contractor and P. (Andy) Nielsen for L. H. Hansen & Sons. For the Bureau of Reclamation, R. B. Williams, Construction Engineer of the Friant Division, was in general charge, with R. K. Durant, Division Engineer, in direct charge of all canal work.

New Athey Vice President

B. F. Lease, Sales Manager of Athey Truss Wheel Co., Chicago, was elected Vice President in charge of sales, advertising and service at a recent meeting of the Board of Directors. Mr. Lease has been with Athey since 1931 and has served in a variety of sales positions.

You can't work with prima donnas . . . .

A welding and cutting outfit which fails in an emergency is too great a luxury to own. Sure, VICTOR costs a little more to buy...but it costs so much less to own.

VICTOR EQUIPMENT CO.
844 FOLSOM STREET
SAN FRANCISCO 7, CALIFORNIA

VICTOR

TODAY A JUNGLE
TOMORROW A RUNWAY

WILL THEY EVER mount a Diesel Tractor alongside the cannon on a courthouse lawn to honor this great combat weapon? Anyway, it's an idea! For here's a peace-time builder that's a sensation on the battlefield, winning praises from GIs and Generals alike—moving dirt, rock, sand, frozen tundra and jungle swamp—by the ton and in a hurry.

Tens of thousands of International Tractors are serving the military—in the Army, the Navy, the Marine Corps and the Air Forces. Tractors pave the way for airpower, footpower and firepower . . . *All honor to the men who drive them!*

While these tractors are fighting on the battlefront, it's up to all tractor operators to conserve equipment here on the home front. *Make it last!* Harvester and the International Power Distributors stand ready to see you through.

If your need for new equipment is vital to the war effort, we will have equipment for you. If your need is less vital we will safeguard your present International Power with every service at our command.

And in the meantime, let's all remember that it's up to all of us to fight harder on the home front . . . fight on the food front—give to the blood bank—buy extra War Bonds—fight inflation. FOR VICTORY.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

INTERNATIONAL HARVESTER
Power for Victory . . . Power for Peace

Armor-Coat Surface For State Highways

Policy and Methods Used In Connecticut to Maintain Large Bituminous Mileage In Safe, Smooth Condition

✦ STONE surfacing is applied on any type of stabilized pavement in Connecticut to strengthen the surface, to renew the wearing course, to prevent and retard disintegration, to seal a porous condition, to provide greater non-skid qualities or to reduce long-run maintenance costs. Only roads free from serious drainage conditions, and from the irregularities of high crowning, settlement, and the like are stone-surfaced. Asphaltic bitumen is preferred for this type of work, and the stone may be either ¾ or ½-inch, depending on conditions. Under ordinary circumstances the work is carried out on one-half the pavement width at a time and progresses in the direction of traffic. The work on one-half of the pavement width, however, is not extended unduly ahead of work on the other half. Stone surfacing is done, as a general rule, during the months of July and August.

Preparation of Roadway

Pavements to be stone-surfaced must be dry, clean, and free of dust. Preliminary shaping, surface treatment and patching are carried out at least four weeks in advance of actual stone-surface work. Patches of porous material are given a lightly sanded seal coat of RC-2 asphalt at the rate of 0.1 gallon per square yard.

Especially careful consideration is given to weather conditions, and stone surface work is not started if the weather is unfavorable or dubious. If rain occurs while the work is in progress, it is discontinued immediately and not started again until the pavement surface is entirely dry.

Bitumen Application

The bitumen is applied by a governed pressure distributor equipped with both truck and pump tachometers. The individual runs of a distributor are normally kept between 500 and 1,000 feet. Shorter runs would increase the opportunity of excessive or deficient application, resulting from the distributor's starting and stopping, while longer runs would create a difficult traffic problem and might allow the bitumen to become undesirably cool before the stone is spread. Rigid control of the quantity of bitumen applied is maintained at all times. While reliance is placed on tachometer settings of the distributor, the rate of application is checked frequently by taping the surface covered and taking gage readings of the bitumen in the distributor tank.

Highly successful results have been obtained using asphaltic cement, RC-5 asphalt, or asphalt emulsion for the bitumen. Asphaltic cement is applied at a temperature between 300 and 350 degrees F., using 0.34 gallon per square yard for ¾-inch stone and 0.22 gallon per square yard for ½-inch stone. RC-5 asphalt is applied at a temperature between 175 and 210 degrees F., using 0.40 gallon per square yard for ¾-inch stone and 0.26 gallon per square yard for ½-inch stone, while asphalt emulsion is used at a temperature of about 180 degrees F., at the rate of 0.54 gallon per square yard for ¾-inch stone and 0.36 gallon per square yard for ½-inch stone.

Stone Application

The stone used is either gravel or trap rock, but they are never mixed. It is applied by a mechanical spreader immediately following the bitumen. During the treatment of the first half of the pavement width, a 4-inch-wide strip of the bitumen is left without stone cover, thus insuring, when the second half of the pavement is treated, that the bituminous applications are properly merged and that the stone applications are not overlapped. Any unevenness in the mechanical spreading is corrected by light hand brooming and hand spotting. As a guide to visual inspection, the rate of stone application for short runs is computed from time to time throughout the work, using taped areas and known or estimated tonnages. After the stone has been properly spread, it is rolled by a 10-ton 3-wheel roller. The normal rates of application of stone are 38 pounds per square yard for ¾-inch and

(*Concluded on page 66*)

FOR LONGER HIGHWAY LIFE

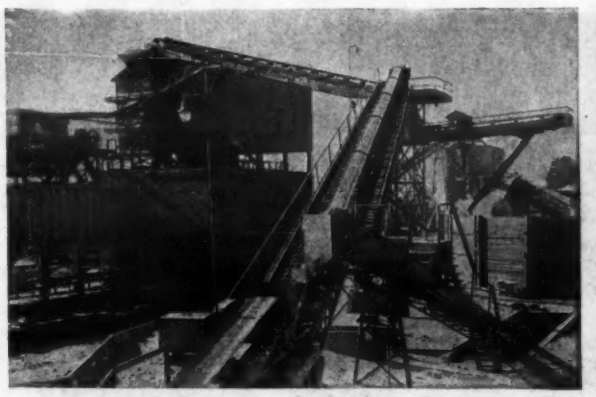
● FLEXCELL is the *approved* modern expansion joint material for all highway and general concrete slab construction. Its long, springy Celotex cane fibres compress under pressure—spring back when the expansion pressure is eased.

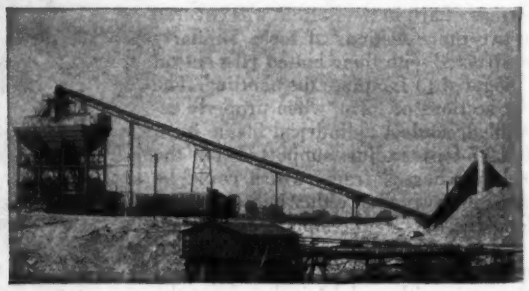
● FLEXCELL never extrudes. Keeps highways smooth, protects them against cracking and buckling. That's why it prolongs road service and gives longer highway life.

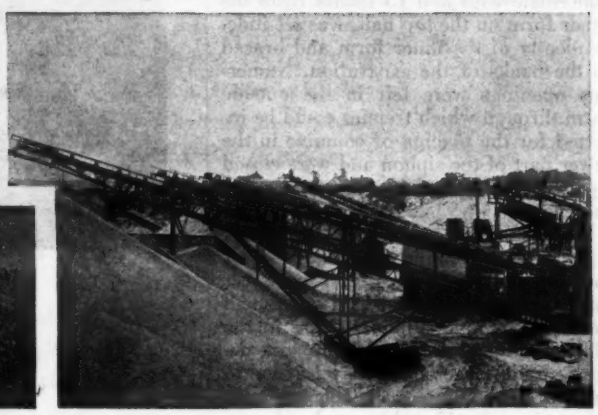
● FLEXCELL is light, easy to handle. It can be set flush or set below the slab surface with poured capping. It's proved its worth by years of service in American roads—with "never a bump in a million miles."

Write for sample and complete information.

THE CELOTEX CORPORATION
Dept. CEM 9, Chicago 3, Illinois
World's Largest Manufacturers of
BITUMINOUS FIBRE EXPANSION JOINT MATERIAL







CUSTOM BUILT

With Standard Units....

Typical of the Barber-Greene concept of Standardized Sectional Conveyor construction are the installations shown here. The belt conveyors used in these plants consist, for the most part, of standard units, pre-engineered and designed for production manufacture. These standard terminals, trusses, carriers, A-frame supports, and take-ups are available in a wide range of sizes and horsepower to meet a custom engineered application.

The Barber-Greene Engineering Department will assist you in utilizing this equipment to best advantage. It is equipment that can be expanded as your plant grows merely by adding standard units. Barber-Greene Co., Aurora, Ill., U. S. A. 44-26

BARBER GREENE
AURORA, ILL., U. S. A.

U. S. Army Photo from British Combine

The 40th Battalion of the Navy Seabees was awarded battle honors by the U. S. War Department "for outstanding performance of duty on Los Negros Island where its members fought as they built and employed their few leisure hours off duty to attack the enemy". There were no "day shifts" for the Seabees during the critical hours of the Los Negros (Admiralty Islands) campaign. Huge portable floodlights kept them building on a round-the-clock schedule.

Parts to Be Repaired Cleaned with Solvent

Every part from a piece of construction equipment that is to be overhauled and repaired should be thoroughly cleaned of grease so that the mechanics can work to the best advantage and know what they are doing. H. L. Perkins Chemical Co., Inc., P. O. Box 1636, Memphis, Tenn., has developed a series of cleaners for this purpose under the general trade name Kleenzall.

Kleenzall A No. 1 is used in any steam cleaning machine for the cleaning of motors and chassis. For removing light grease, such as on motors, only 1 to 1½ ounces are needed per gallon of water, while for chassis and heavy greases 2 ounces are used per gallon. This solution is for general cleaning only and not for automobile bodies. For the cleaning of garage floors to remove oil drippings, from 4 to 6 ounces of A No. 1 are used per gallon of warm water. Garage floors may be wet down and the dry Kleenzall powder sprinkled about, allowed to stand for about one-half hour, and then mopped up with plain water. This cleaning powder does not hurt the hands and may be used to remove paint and grease from hands by merely wetting the palm and then sprinkling a bit of the powder on the hands and washing as usual.

The No. 4 Kleenzall solvent is a special vat compound for heavy-duty cleaning in vats. One pound of the compound is used for each 3 gallons of water. The No. 5 Kleenzall solvent is used for cleaning aluminum and all metal parts. When used cold, the parts are immersed in the cleaner without diluting it and allowed to remain there until the grease and oil have been loosened, then they are taken out, drained thoroughly, and the surplus cleaner removed by dipping the part in a rinsing bath. The parts are best handled by hanging from hooks or suspended in a wire basket. When Kleenzall No. 5 solvent is used in vats heated with steam, it can be diluted as much as 3 to 1. Fifteen minutes in the heated cleaner is sufficient for normal cleaning jobs, while some parts can be cleaned in less time.

Complete information regarding the full line of Kleenzall solvents may be secured direct from the manufacturer by mentioning this item.

New LeRoi Sales Office

The establishment of a new sales office at 1209 Martin Bldg., Birmingham, Ala., has been announced by the LeRoi Co., Milwaukee, Wis., manufacturer of engines, air compressors, and engine-generator sets. C. B. Hall is District Manager in charge.

Construction Workers Are Needed in Alaska

Civilian construction workers, both skilled and unskilled, not now engaged in essential war work, are being sought for work on vital military establishments in the Alaska area, according to information just received from Lt. George A. Quinlan of the Alaskan Department.

Tradesmen in more than thirty-five classifications are needed, with special demand for heavy-duty mechanics, sheet-metal workers, and carpenters. Wage rates are in accord with the A. F. of L. wages at Seattle. The Alaskan Department will furnish Pullman transportation from home, and wages start at the time of boarding the train.

Workers are expected to sign a one-year contract which provides both sick leave and 30-days annual leave (or compensation). Those interested should apply to the Alaskan Department, U. S. Employment Service, 308 No. Michigan Ave., Chicago, Ill., or at the nearest U. S. Employment Service office.

WHERE GOING IS Tough GATKE High-Heat-Resisting Asbestos BRAKE MATERIALS Stand Out

GATKE Brake Blocks and Frictions — Moulded to machined accuracy in ALL shapes and sizes — LARGE or small.

GATKE MAKES
Brake Lining
Clutch Facings
Frictions
Non-Metallic Bearings
Sheet Packing

GATKE High-Heat-Resisting Brake Materials take more punishment because they are made for tough service —using materials and processes developed thru 28 years of specialization.

They are specially engineered by men who understand service requirements for every Brake and Clutch application of Excavating, Road Building, and Construction Equipment.

Just tell us what you need.

GATKE CORPORATION

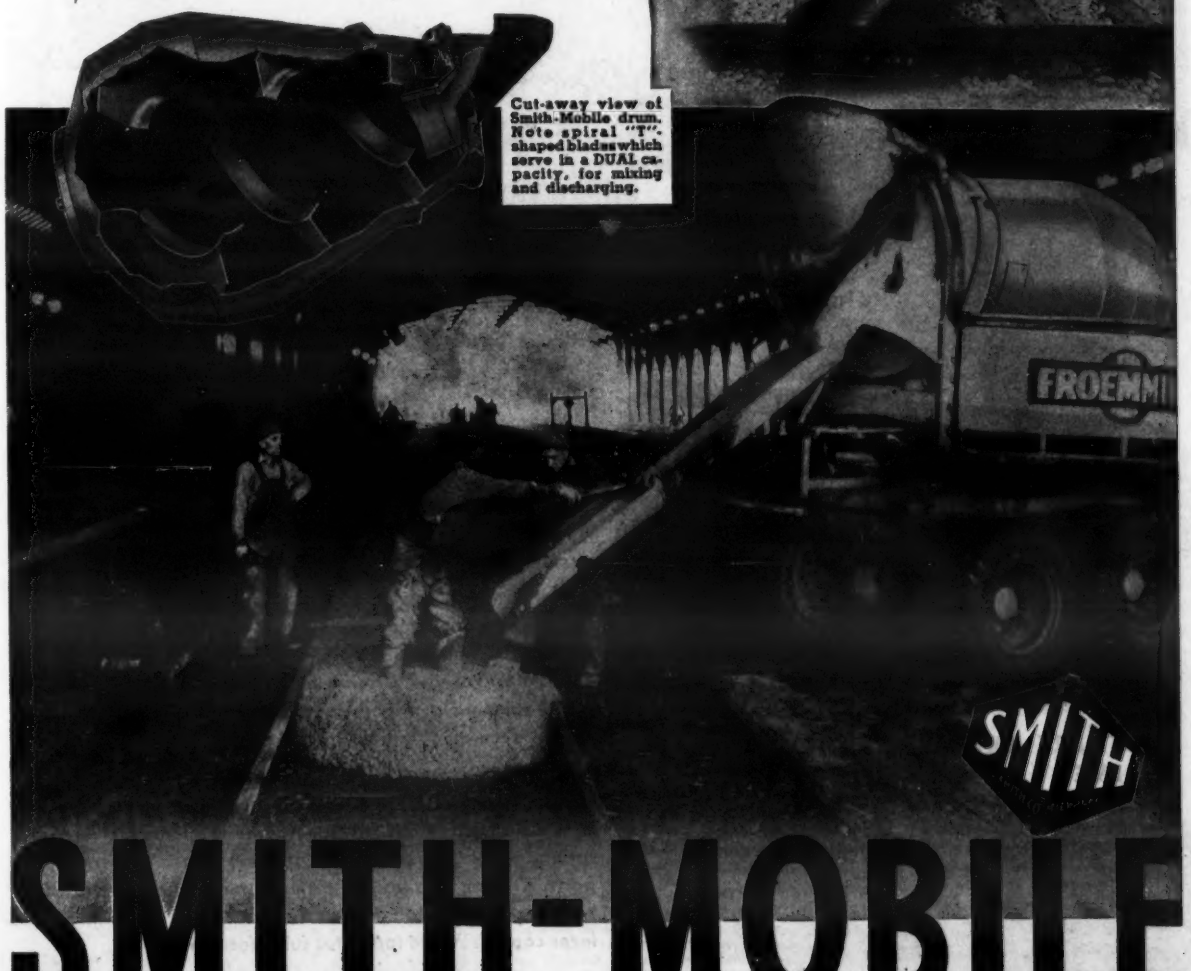
224 N. La Salle St., Chicago 1, Ill.

Thin Grout or No Slump Concrete

...it's All in the Day's Work for Smith-Mobile Truck Mixers!

Smith-Mobile patented "T" shaped blades knead and mix the driest batches... concrete so stiff that most truck mixers would just roll it around in the drum. Then the same blades will discharge thin grout, or *even water,* right down to the last drop. No other truck mixer in the world can do this so easily and efficiently. The Smith-Mobile "T" blades are patented and can't be used in any other truck mixer . . . That's why Smith-Mobile is the undisputed champion among truck mixers.

THE T. L. SMITH COMPANY
2857 North 32nd Street • Milwaukee 10, Wisconsin, U. S. A.



Cut-away view of Smith-Mobile drum. Note spiral "T"-shaped blades which serve in a DUAL capacity, for mixing and discharging.

SMITH

SMITH-MOBILE

4400-1P

Shipments of Mixers Decline in Volume

Sharp reduction in civilian construction caused a decline in shipments of concrete mixers in 1943, according to figures released by the War Production Board, which show that a total of 2,631 were shipped in 1943 in contrast with a yearly average of nearly 7,000 for the 1937-41 period. During 1941 alone, shipments of this type of equipment totaled 9,243. The yearly figures are as follows:

Concrete Mixers		
Year and	Quarter	Total Shipments
1937	Total	6,399
1938	"	5,684
1939	"	6,372
1940	"	7,133
1941	"	9,243
1943	"	2,631
1942	4th	1,007
1943	1st	864
	2nd	778
	3rd	471
	4th	518

It is interesting to note that this drop in the number of concrete mixers shipped is concentrated on the small sizes (3½ to 5-cubic-foot) which accounted for approximately 67 per cent of the shipments during the pre-war period and less than 22 per cent of the shipments in 1943. Military demand for the 14-cubic-foot mixers brought shipments of this size up to 40 per cent of the total in 1943, in contrast with 5 per cent of the total in the 1937-41 period. Sizes over 14-cubic-foot accounted for less than 1 per cent over the entire period under consideration. Following is a breakdown of yearly shipments by sizes:

	3½ Cu.-Ft.	5 and 7 Cu.-Ft.	10 Cu.-Ft.	Over 10 Cu.-Ft.
1937	3,578	1,582	936	203
1938	2,986	1,490	957	251
1939	3,494	1,525	955	398
1940	3,939	1,701	942	551
1941	4,660	2,696	1,148	739
1943	507	799	259	1,066

Unfilled orders for concrete mixers at the end of 1942 were 1,362, and 1,180 at the end of 1943.

Shipments of truck-mounted concrete mixer-agitators during 1943 declined to 261 or 23 per cent of the yearly average for the 1937-1941 period. This downward trend, which continued in the first quarter of 1944, coincides with the decrease in the construction of housing developments, general construction, sewers, streets, sidewalks and roads, where this type of equipment is principally used. In the first quarter of 1944 only 29 were shipped. The following table gives the comparative figures in detail.

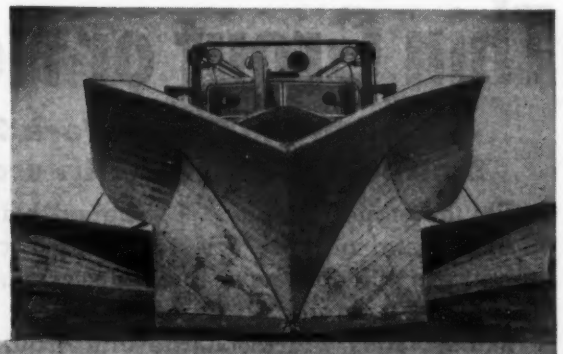
Concrete Mixer-Agitators, Truck-Mounted		
Year and	Quarter	Shipments
1937	Total	789
1938	"	494
1939	"	992
1940	"	1,335
1941	"	2,164
1943	"	261
1942	4th	160
1943	1st	78
	2nd	49
	3rd	86
	4th	48
1944	1st	29

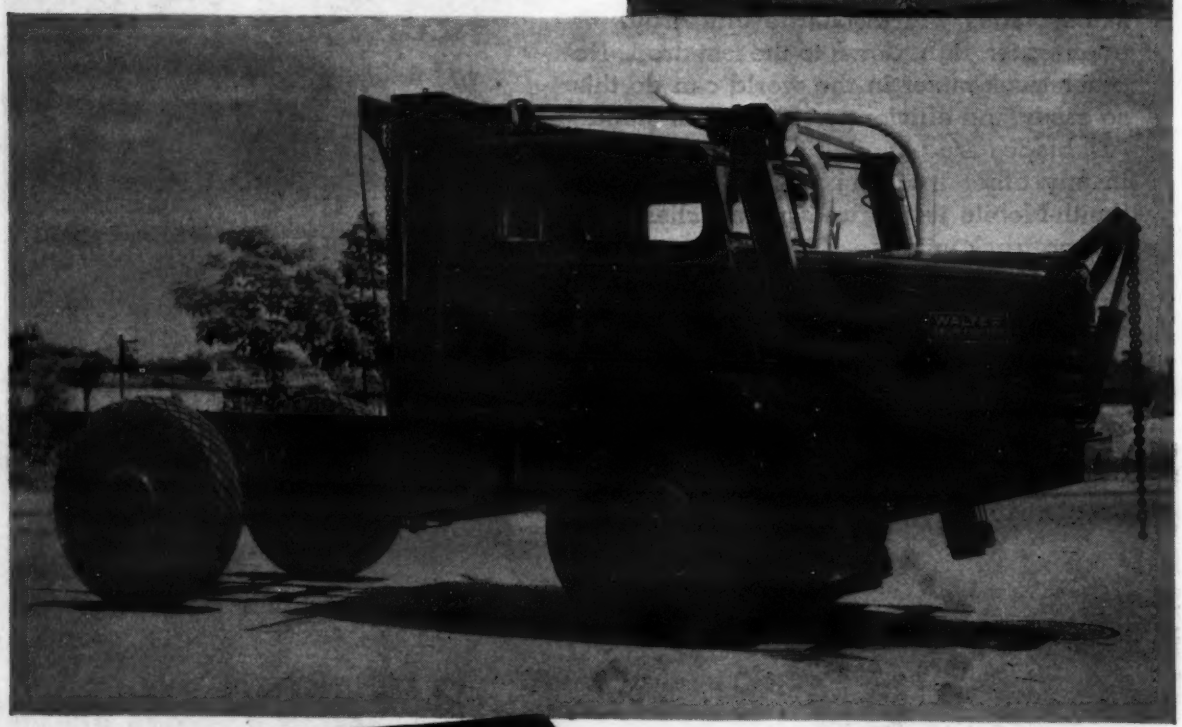
All of these figures represent 100 per cent of the industry producing this equipment.

Caterpillar Names New Merchandise Dept. Mgr.

The appointment of L. C. Allenbrand as Manager of the Merchandise Department has been announced by the Caterpillar Tractor Co., Peoria, Ill. Mr. Allenbrand, who has held a number of positions in the Caterpillar organization in the sales and industrial relations departments, succeeds H. R. Murphy who left the company to become associated with the Caterpillar dealership in San Antonio, Texas.

IT'S
THE TRUCK
BEHIND THE PLOW
THAT COUNTS!





WALTER
SNOW FIGHTERS

THERE ARE MODELS TO MEET EVERY SNOW CONDITION,

topped by the 250 H.P. Walter Snow Fighter. This powerful unit clears a 28 ft. width in one run—has rugged power to smash through road-blocking drifts plus speed to clear more miles per hour—throws snow far to the side to make widening-out easier.

The first requirement for efficient snow removal is a specialized truck having great Power, Traction and Speed. Without these, the best designed plow equipment is mere "window-dressing"!

Walter Snow Fighters have all three—Power, Traction and Speed—in an advanced degree. They're designed specifically for the tough job of snow removal. The exclusive Walter Four-Point Positive Drive eliminates slipping, stalling and wheel-spinning . . . by proportioning power to FOUR driving wheels according to their *traction* at any instant.

Suspended Double Reduction Drive (with the first reduction gears suspended from the frame instead of in conventional axle housings) results in higher ground clearance, less unsprung weight, larger gear capacity, better protection for parts. Tractor type transmission provides six speeds forward, two reverse, fast high gear and powerful low gear *with single lever control*. Write today for full information.

WALTER MOTOR TRUCK COMPANY • 1001-19 IRVING AVE., RIDGEWOOD 27, QUEENS, L. I., N. Y.

SAVE
MONEY,
TIME and
LABOR!
with the
new
SYNTRON
GASOLINE HAMMER
PAVING
BREAKER

100% Self-Contained
No Air Compressor and Hose
No Battery Box and Cable
No Springs

A "heavy-duty" tool for—
Busting Concrete
Breaking Rock
Cutting Asphalt
Digging Shale—Tamping
and many other jobs.
Quickly-Easily-Economically

POWER!
POWER!
POWER!
to spare.
Portable
Low Fuel
Consumption
Write for illustrated folder.

SYNTRON CO.
227 Lexington, Homer City, Pa.

Change of Address
(Mail to Contractors and Engineers Monthly, 470 4th Ave., New York 16, *today*)

From _____
(Former address)
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To _____
(New address)
_____
_____

Name_____
Firm_____
Position_____

Yearly Improvement Of County Dirt Roads

(*Continued from page* 12)

this plant in operation it is expected to be possible to improve the mileage of dirt road more rapidly than has been done in the past, as well as to make caliche easily available for patching existing untreated bases. Drilling in the caliche pits is performed by hand.

In addition to the motor graders, used principally on maintenance work, four tractors, including a Caterpillar RD7 and a Caterpillar D7, an International TD-18 and an Allis-Chalmers Model K, are used by the county, with two Adams 12-foot blade graders, three 2-yard rotary fresnos, and a 42-inch Caterpillar elevating grader for construction operations. Five Ford, seven Chevrolet and one GMC dump trucks are available, as is one Ford flat-bed truck.

Materials bought from commercial producers, either for seal-coat work, surface treatment, or concrete construction, are ordinarily unloaded and hauled by county equipment and forces.

County Shops

The county shop is a sheet-iron building 40 x 60 feet in size with a concrete floor, housing a drill press, forge, acetylene welding equipment and small tools, set in a fenced storage area approximately an acre in size. Major repairs to equipment are made in commercial shops, with which Amarillo is plentifully supplied, as the small amount of equipment owned by the county does not justify the acquisition of machinery or man-power sufficient to do major overhauls.

Personnel

The Commissioners Court of Potter County, Texas, is composed of: E. O. Northcutt, County Judge; Morris Browning, Commissioner, Precinct No. 1; Jack Swann, Commissioner, Precinct No. 2; Ray Daniels, Commissioner, Precinct No. 3; and George Killian, Commissioner, Precinct No. 4. J. L. Adams is County Engineer; Hobart Van Valkenburg, County Road Foreman; and John W. Crudgington, County Auditor.

Many Public Works In Chilean Program

A public works program calling for an investment of 6,000,000,000 pesos, or approximately $340,000,000 at current exchange rates, has been outlined by the Chilean government as a means of averting possible economic disruption arising from reduced copper, nitrate and mineral production in Chile after the war. The program, which will be spread over five or six years, includes a wide variety of projects.

Preliminary surveys on many of the projects contemplated have been completed, and include railroads, highways, bridges, water and irrigation systems, harbor improvements, government buildings, and numerous other projects. The program would be financed by bond issues which will be available to foreign and domestic purchasers.

Railroad construction included in the program will be aimed particularly at completing unfinished sections of existing lines and improving service on the Transandine route linking Chile with Argentina. This railroad will connect the city of Antofagasta and Chile's northern mineral wealth with the cattle-raising and agricultural areas around Salta in Argentina.

To raise the health and living standards in congested urban areas, it is planned to set aside approximately $25,000,000 for low-cost housing projects, and another $5,000,000 for recreational facilities.

Improved communications and irrigation projects in the semi-arid northern portion of the republic also would make that region more attractive to colonists, and possibly would draw surplus labor away from curtailed mining operations to intensified agricultural production in the area. Government officials are so confident that this movement back to the land will begin as soon as highway, railroad and irrigation construction is started that special committees have been created to draw up plans for large-scale colonization in the northern provinces.

New Welding and Cutting Safety Standards Issued

Another in the series of American War Standards developed by the American Standards Association has just been published. Entitled "Safety in Electric and Gas Welding and Cutting Operations," this 32-page booklet is designed to serve as a guide for the protection of the individual operator from injury or illness, and for the protection of property from fire and other damage arising from improper methods in the installation, operation or maintenance of welding and cutting equipment. Initiated by the International Acetylene Association, the American Welding Society, the National Electrical Manufacturers Association, and the Division of Labor Standards of the U. S. Department of Labor, it covers every phase of safety applicable to all ordinary welding, cutting, brazing, lead-burning, and flame-treating operations.

Copies of this interestingly written booklet may be secured from the American Standards Association, 29 W. 39th St., New York 18, N. Y. Price: 40 cents, per single copy. For quantities of 25 copies or over, the cost decreases, depending upon the number ordered.

MONDIE DROP and UPSET FORGINGS
FOR CONSTRUCTION EQUIPMENT
Such as Dipper Teeth, Trencher Teeth, Gear Blanks, Levers, Tie Rods, Cranks, Crank Shafts, Special Shapes, etc. Forging weight range from 1 to 50 pounds.
Inquiries given prompt attention by our Engineering Dept.
MONDIE FORGE COMPANY INC.
10299 Berea Road Cleveland 2, Ohio

these users of BUTLER EQUIPMENT who have won the Army-Navy E*

Austin Company
W. S. Bellows
Brown & Root Co.
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J. Rich Steers, Inc.
James Stewart & Co., Inc.
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BUTLER *Congratulates*

its friends and customers who have won the Army-Navy "E" Award — an honor given only for exceptional service in providing vital facilities for waging our global war.

The Butler Bin Company is proud of the part its equipment has played in the speedy completion of the projects of these outstanding construction firms; proud that efficient equipment teamed with efficient management helped to work production miracles.

No accident is the performance of this equipment. Every plant is an Engineered Design, planned to meet all local conditions and tailor-made for each job; efficient, trouble-free operation is built in.

Butler concrete plants, central mixing plants, aggregate plants, and road building equipment are now at work on vital war construction. Whether you are planning a war or post-war project, plan now to use Butler equipment; our engineers will gladly work with you in this first step toward Excellence in Production.

* We have tried to make this list complete to the best of our knowledge; but to any Butler equipment operators who have won the burgee whom we may have missed, our sincerest apologies.

BUTLER BIN COMPANY
WAUKESHA, WISCONSIN

Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

The "Sheep" or "Goats" Under Wage and Hour Law

Highways used for interstate or international travel and transportation are "instrumentalities of interstate commerce" within the meaning of the regulatory provisions of the Federal Wage and Hour Law. So ruled United States District Judge Joyce of Minnesota in the case of Walling v. Craig, 53 Fed. Supp. 479. His opinion also holds that contractors engaged in repairing, maintaining and reconstructing such highways are governed by the law as to employees intimately connected with the interstate aspects of the highways, while not so governed as to certain other classes of employees.

The action was brought by the Wage and Hour Administrator against a partnership having its headquarters in Minneapolis, but engaged in repairing, etc., highways in several other states in the Northwest, as well as in Minnesota. Generally, however, each separate contract covered a section of road lying wholly within one state.

Judge Joyce ruled that the following classes of employees were covered by the Federal statutes relating to minimum wages and hours of work: Foremen and office employees, performing duties in ordering, receiving and unloading interstate shipments, etc., and employees operating tank trucks transporting bituminous material shipped into the state by rail, and distributing the material on roadways. Judge Joyce ruled that the following classes were not governed by the Law: Off-the-road employees preparing local materials, such as sand, gravel, etc., and operating stationary bituminous plants; and employees engaged during dead seasons in repairing and reconditioning the employers' equipment, in the absence of proof that the equipment would be again used on the highways.

Another point decided by Judge Joyce is that under the circumstances involved in this case, none of the employees could be regarded as falling within the provision of the Wage and Hour Law which applies to employment by states and other political subdivisions.

The Difference Between Private, Public Contracts

A vital distinction between the rights of a contractor under a public construction contract and his rights under a private contract is noted in a decision announced by the Nebraska Supreme Court on the appeal of Roadmix Construction Corp., 9 N. W. 2d, 741. A general rule, with some of its qualifications, is thus stated by the court:

"The State is as much bound by the terms of its contracts as are individuals and generally a contract between individuals and the State for the construction of highways, and all other public improvements which the state is authorized to make, should be construed and liabilities determined by the same rule as governs contracts between individuals. This rule should in no way be permitted to conflict with the universally recognized and enforced rule that neither a State nor the United States, in the absence of a general statute, can be made to respond in damages for the torts of its officers or agents. * * *

"Employees, agents and officers of the State are limited in their capacity to act for the State to the express authority given them by the Constitution or statutes and the provisions of contracts executed by authority thereof * * * and they cannot waive such provisions and the State be bound. *Parties dealing with the State must take notice of this limitation of their authority.*"

Road Contractor Upheld In Claiming Extra Pay

The contractor on a state road job in New York was required by the state's chief engineer to depart from orderly progress of the work and construct a work road for a bridge contractor. And after part of the principal road was completed, the engineer required the contractor to raise the grade in some places. Deciding that additional compensation was due, the Appellate Division of the New York Supreme Court, Third Department, said in the case of Nugent v. State, 40 N. Y. Supp. 361:

"Claimant is entitled to payment for the additional work he did in connection with the bridge contractor's road, and to such damages as were caused him through interference with a proper plan of progress. An item of damage asserted is that the contractor, in carrying out the instructions of the engineer, used earth to grade the work road, where, had he been permitted to proceed in an orderly way, rock would have been used in the depressions. The rock which could have been used increased the surplus which later was dumped into the swamp and covered with earth under the direction of the engineers. * * *

"Changes of grades after a road was finished seem to be in the same category. Slopes of embankments adjacent to cuts were changed in a manner asserted to be costly, as a steam shovel had to be driven up a ramp in order to do the work from the top."

It was decided that there was ample proof that the extra burdens placed upon the contractor were sufficiently and promptly protested. But the court ruled that reasonable value of the work done was the proper basis for measuring additional compensation, as distinguished from a cost-plus basis.

Contractor's Liability For Acts of Employees

It is not always an easy matter to determine whether or not an employer is liable for injury to a third person, due to a negligent act of an employee. It is perfectly clear that an act which is utterly unrelated to the worker's employment does not make the "Boss" liable. It is equally clear that a careless act committed in the line of the work assigned to the employee does make the employer liable for resulting injury to an outsider. But there is a wide twilight zone between these two extremes where the question of liability or no liability is not so easily determined.

Take, for example, a case lately decided by the Illinois Appellate Court. There a construction company leased a dragline with an operator for use on a sewer project, *solely for the purpose of trench excavation.* Exceeding his authority, the operator of the dragline used it to lift a trailer loaded with pipe, thereby greatly overtaxing the lifting capacity of the dragline. The line broke, causing the death of a sewer worker. A jury awarded $6,000 damages against the construction company, but the Appellate Court set the award aside, holding that the company was not liable because the accident occurred while its employee was unauthorizedly acting outside the scope of his employment. (Koepke v. Matthews Bros. Const. Co., 47 N. E. 2d, 34.)

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YOUR ASPHALT PLANT by installing *The* FLUIDOMETER

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With a Fluidometer System, a push button replaces the weighing bucket routine. When the button is pushed the Fluidometer delivers the predetermined quantity, then automatically resets for the next delivery. Or it may be operated automatically by the mixer time lock. Paving mixtures are held to precise limits of uniformity—time and operating costs saved. Adaptable to all types of plants. Write for descriptive literature.

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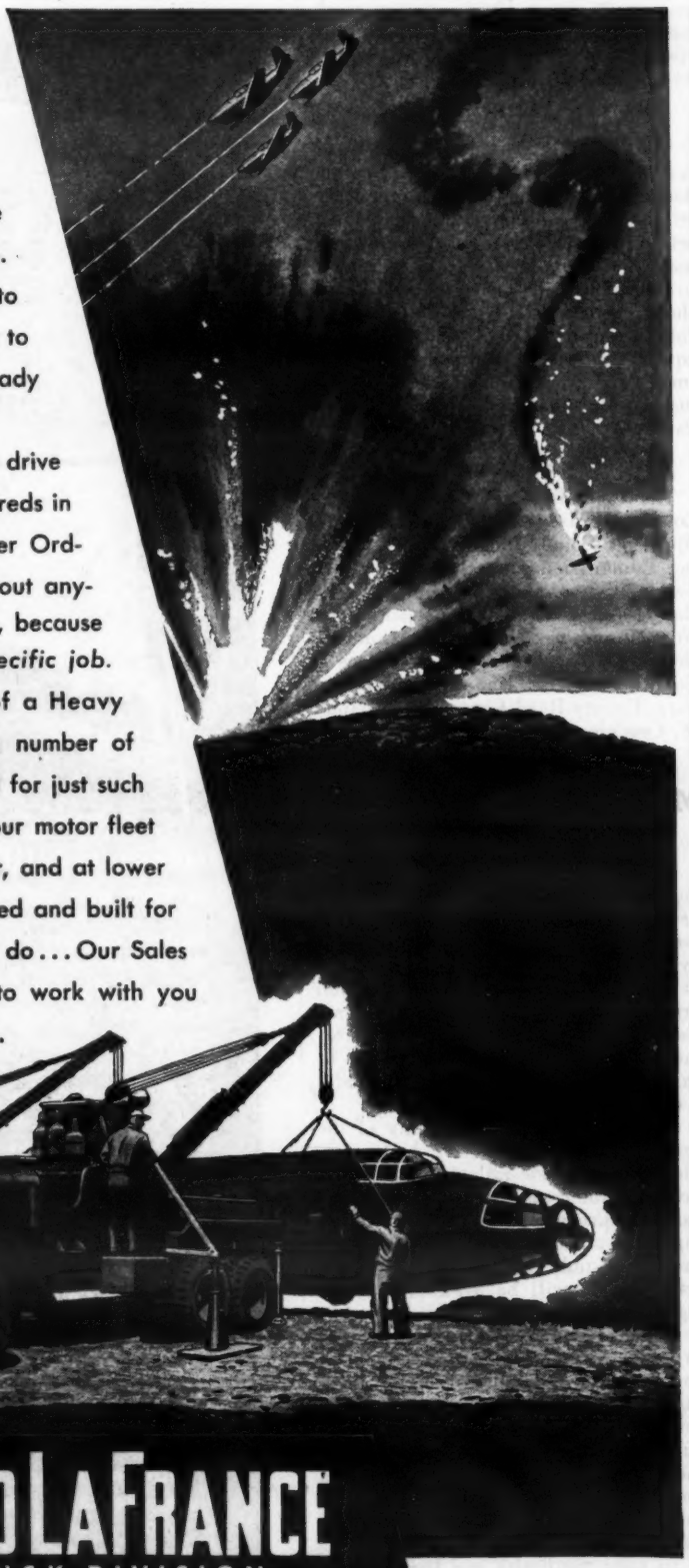
These ten-ton trucks, with ten-wheel drive are made and equipped by the hundreds in our Elmira Factories for the Rochester Ordnance District. They can go just about anywhere, and perform amazing feats, because they are *engineered to their specific job.*

You may never have need of a Heavy Wrecker (although a surprising number of inquiries have indicated a need for just such a vehicle), but whatever job your motor fleet has to do can be done better, and at lower cost, if the trucks are designed and built for the specific job they are to do... Our Sales Department will be glad to work with you now on your requirements.



WARD LaFRANCE
TRUCK DIVISION
GREAT AMERICAN INDUSTRIES, INC.
ELMIRA NEW YORK

The wicket set on the road and shown at the instant the Cartwright tripping device strikes it and starts the flow of bitumen from the spray bar of the distributor.

An Automatic Starter For Applying Asphalt

In order to insure a clean joint every time between succeeding applications of bitumen to highway surfaces, Cartwright Asphalt Equipment Co., Galion, Ohio, has developed an automatic device to start the spray exactly where the last shot ended, so that it is not necessary to rely on the skill of the operator.

The device consists of a wicket placed on the road 12 inches ahead of the point where the asphalt is to be applied. This distance corresponds to the distance the trip arm is ahead of the nozzle. The distributor is run down the line and when the arm, which is part of the air control of the spray bar, strikes the wicket the spray is started instantly. The same device picks the wicket up and carries it along with the truck ready to be re-set for the next shot. The manufacturer claims that this device completely eliminates lapping or skipping.

The automatic device has been developed for use with the Cartwright hot spray bar in which the bitumen is right at the nozzle slot and hence starts flowing the instant the bitumen is turned on. This spray bar with the air control can be applied to any make of distributor. If the truck on which the distributor is mounted has air brakes, no additional compressor is required. The automatic device with the Cartwright spray bar and air control makes it possible for a distributor to apply asphalt accurately with only the driver on the truck, according to the manufacturer's statement.

Complete information regarding this automatic feature as well as the spray bar itself may be secured direct from the company by mentioning this item.

Fire Prevention Week

The week of October 8 to 14 will once again be observed as National Fire Prevention Week. With all eyes turned toward the firing line overseas, the subject of fire defense at home may seem trivial and unimportant. However, we are in a period of sharply increasing fire losses, piling up at the rate of more than $1,000,000 a day at last report. The tragedy of these fires is underscored by the fact that most of them could have been prevented, or at least need not have become disastrous, had fire defense measures been in force.

The week marking the anniversary of the great Chicago fire is chosen as Fire Prevention Week to serve as the initial week of a year-round activity promoted to making America a safer homeland. A great deal of practical information about fire safety has been gained in recent years, and it is a patriotic duty to use this information in a positive united program for safeguarding lives and property against loss by fire.

It is suggested that during Fire Prevention Week, you look over your fire protection equipment, be sure that it is adequate, that fire extinguishers are properly placed and marked so that they can be found easily in an emergency, and that the personnel is trained in their use. Inspect your shops, garages and offices, looking for fire hazards, and eliminate them at once. If you have any problems or questions on how to provide adequate protection against fire, the National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass., will be glad to help you.

D'Aquila Joins Iowa Mfg.

Frank P. D'Aquila, lecturer and author on Latin American relations, has been made Export Sales Manager of the Iowa Mfg. Co., Cedar Rapids, Iowa. Trade and Good-Neighbor relations with Latin America have been Mr. D'Aquila's key interests since his graduation from the School of Foreign Service of Georgetown University.

He has traveled extensively in Latin America and contemplates a visit in the near future to Iowa Mfg. Co. dealers in those countries.

A GUIDE POST IN PLANNING TOMORROW'S HIGHWAYS
TUTHILL HY-WAY GUARD
The Spring Cushions the Shock
Air-like speeds of post-war automobiles demand increased protective measures in building more and better highways. TUTHILL combines this added safety with low cost of installation and upkeep.
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Big Highway Program Planned in Kentucky

At the recent annual convention of the Kentucky Rural Letter Carriers Association in Lexington, J. S. Watkins, State Highway Commissioner, predicted the greatest era of highway construction in the history of that Commonwealth at the close of the war. Mr. Watkins reported that the following road building program is planned:

1. The reconstruction of existing state highways to standards suitable for modern traffic.
2. The expansion of the state highway system to include greater mileage.
3. The provision of a limited national system of super-highways with adequate access to urban areas.
4. Attention to county roads which are sometimes referred to as land-service roads and which are tributary to the main routes of the primary and secondary systems.

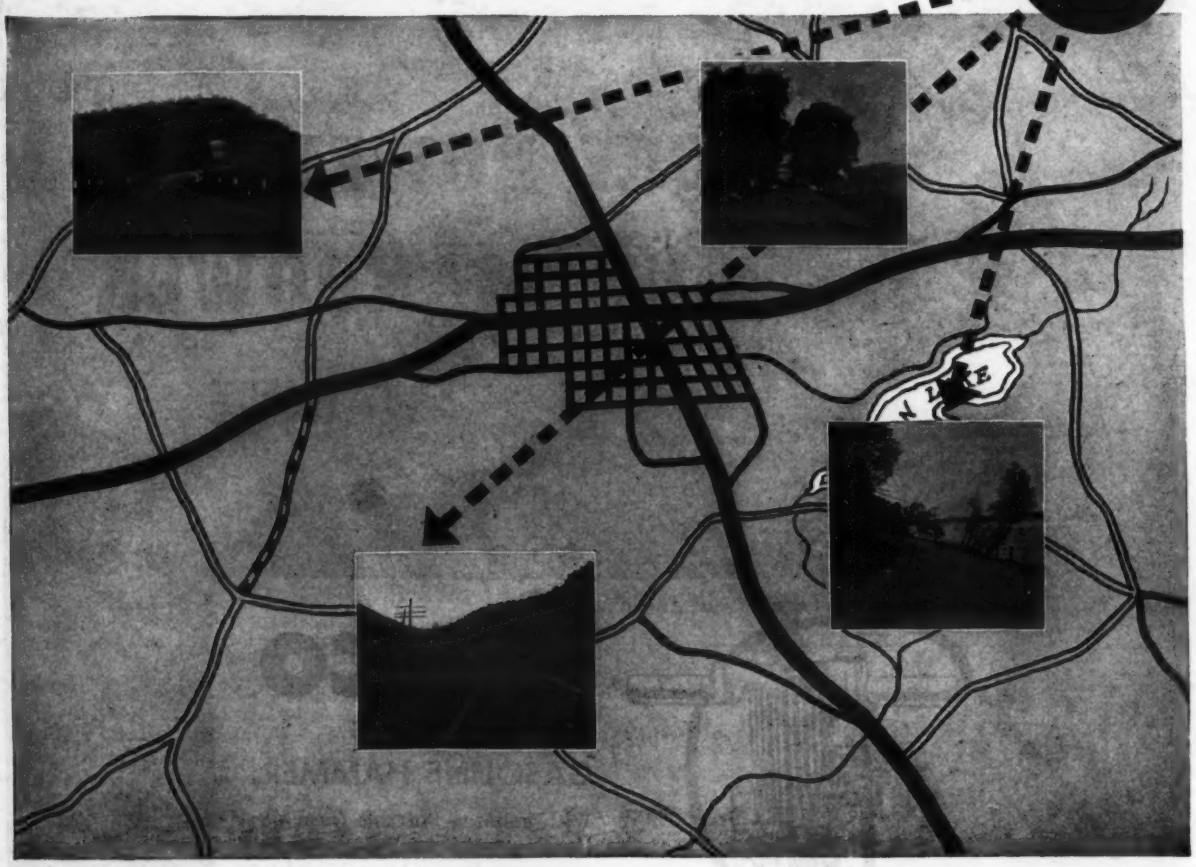
Commissioner Watkins states, however, that the improvement and expansion of the state highway system depends upon the authority and funds delegated to the Department of Highways. He further pointed out that an important step in this direction was taken by the 1944 General Assembly by initiating the future submission of an amendment to the State Constitution to prohibit the diversion of highway and motor-vehicle revenues to non-highway purposes. The Commissioner warned, according to *The Scraper*, that unless money designated for highway purposes is placed in a central fund so that it can not be diverted for other purposes, the entire program of the highway department will bog down.

The Department of Highways has formulated a program of over 500 needed highway construction projects, estimated to cost about $125,000,000, and plans and specifications are being completed for this proposed work. The highway legislation now pending in Congress provides for a large amount of Federal-Aid funds for the first three post-war years. Kentucky's share of these funds, when matched on a 60-40 or 50-50 basis with state funds, would be sufficient to indicate an annual construction program of from $15,000,000 to $20,000,000.

Commissioner Watkins told the rural carriers that, of the 29,000 miles of rural-highway mail routes in Kentucky, a little over 8,000 miles are on the state highway system; the remaining 21,000 miles are on the county roads. He further advised them that all the 8,000 miles of state highways used for mail routes have been improved, and all except 32 miles, which have been graded and drained, are surfaced for all-weather use. He said that of the 21,000 miles of mail routes over county roads only 13,000 miles are improved, 11,800 miles surfaced, and 1,300 miles graded and drained, while nearly 8,000 miles remain unimproved. Mr. Watkins emphasized the fact that the Department of Highways is interested in all of the roads of Kentucky and not just those that constitute the present limited official state highway system.

POSTWAR HIGHWAY PLANNING?

It should start at these vital spots



THE U. S. Highway industry is already preparing for its greatest job after the war is won, for today's roads are wearing out faster than ever before and much-needed highway improvements have been unavoidably delayed by manpower and equipment shortages.

Especially in the all-important secondary road system, where regular maintenance is a first requirement, worn out roads are costing this country millions of dollars—in excess damage to automobiles and tires; delaying vital shipments of food and munitions, driving thousands of trucks prematurely to junk piles and seriously impeding transportation.

Why wait to make *your* plans for postwar highway work? Call on the services of the Tarvia field man. He can show you how to plan and prepare needed construction, reconstruction, maintenance and repair using local materials and local labor; how to clear the decks for postwar action.

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Double Pipe Siphons At Bridgeport, Conn.

Spearin, Preston & Burrows Pulled Pair of Pipes Across Narrow Channels, Using a Novel and Quick Method

(*Photo on page* 88)

✦ TWO stream crossings with double cast-iron pipe inverted siphons are included in the $1,318,732 sewer construction program now in its last stages at Bridgeport, Conn., ready for the construction of two sewage-treatment plants at an added cost of $2,000,000. The siphons were Contracts V and VIII of the program (See C. & E. M., July, 1944, pg. 21) and represent the crossings of Johnson's Creek and Yellow Mill Pond. Spearin, Preston & Burrows of New York City was awarded the two contracts for $37,725 and $82,860 respectively. The contractor used similar methods, developed in its own organization, for placing the two double-barrel siphons by pulling the pipe across in a dredged trench.

Johnson's Creek Siphon

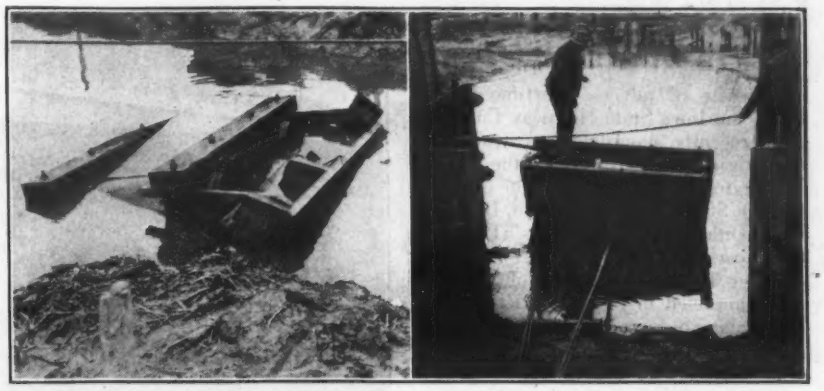
The Johnson's Creek siphon, Contract V, is a double inverted siphon 270 feet long, requiring 480 feet of 24-inch cast-iron pipe, and two concrete siphon chambers. The lead pipes for the siphon were placed side by side in a traveling skid or "toboggan" which had enough lumber in it to give some buoyancy, and the forward ends of the pipe were plugged to keep out mud and trash. A pair of skids were then built of 14 x 14-inch timber on a 20-degree slope on the shore. On each pair of skids three12-foot lengths of pipe were lead-caulked together, forming two 36-foot stiff lengths of pipe which were then caulked into the two lead pipes in the "toboggan".

Immediately after the pipe was caulked into the leading pipes, the joints were broken just before the unit was pulled forward so that they would be sufficiently flexible to conform to the contour of the river bottom.

A 14 x 14-inch stick 16 feet long was buried as a deadman 6 feet in the ground on the opposite side of the creek and a cable run out to the edge of the shore to hold a 6-line sheave. This cable was run back to the drum of the crane which did the pulling, and the block at the other end of the 6-part line was attached to the front of the toboggan. Pulling at the Johnson's Creek crossing was started at 8 a.m. and finished at 6:30 p.m. The actual pulling took about 6 hours and was done between high tides. When the first section of three pipes had been pulled down to the water's edge, another section of three pipes was assembled, caulked and connected to the line already in the water. An extra cable was lashed to the line of pipe when the double siphon was about half way across to relieve the strain on the joints. Also, empty oil drums were attached to the line to give buoyancy to the latter part of the line during its crossing.

Yellow Mill Pond Siphon

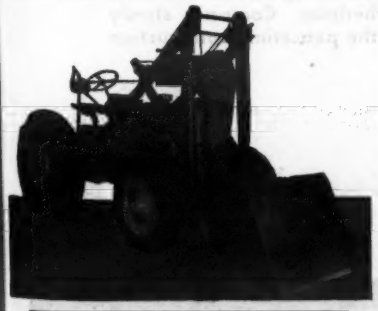
The trench for the Yellow Mill Pond siphon of double 30-inch cast-iron pipe 800 feet long, requiring 1,762 feet of pipe, was excavated by the dipper dredge Capital City IInd, owned by Lavien & Smith of East Providence, R. I. The trench was excavated under water to a depth of 23 feet and was 30 feet wide at the top. Both before and after this operation, this same dredge worked on excavating the river channel for the U. S. Engineers. The excavation was loaded onto scows, towed a 3½-hour trip out into Long Island Sound, and dumped.



The double line of cast-iron pipe for the Johnson's Creek siphon at Bridgeport, Conn., was pulled across by means of a traveling skid or toboggan. At left, a side view of the skid; at right, the skid just as it reached the far shore.

The line leading to the siphon chamber from the land side is 36-inch reinforced-concrete pipe placed in a 14-foot-deep trench excavated by a Koehring crane with a Williams clamshell bucket and finished off by hand. The deep trench was sheeted with 2-inch boards 6 and 8 inches wide driven by a drop hammer and has 6 x 6-inch wales. The excavation was completed, the pipe was placed and material backfilled from a stockpile by the same crane and bucket

(*Concluded on page* 80)



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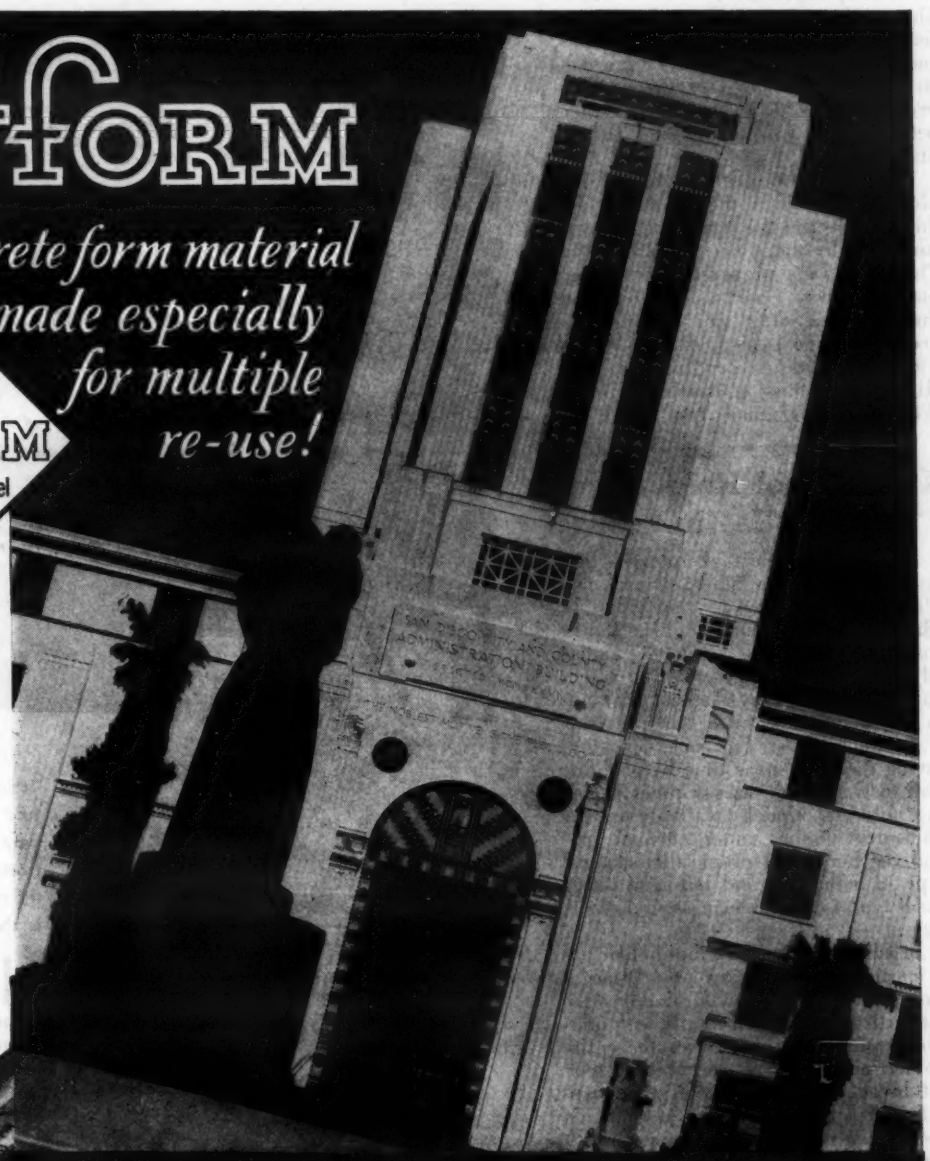
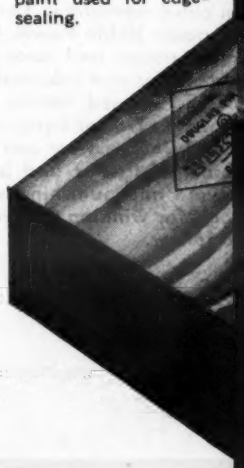
GENUINE DOUGLAS FIR PLYFORM Concrete Form Panel D. F. P. A. INSPECTED



Douglas fir plywood concrete forms were used on this beautiful San Diego City and County Administration Building — a typical example of the smooth modern lines made possible through use of PLYFORM.

PLYFORM is identified by the "grade trade-mark" shown above, and by the distinctive silver-green paint used for edge-sealing.



Douglas Fir Plywood is now available only on highest priorities. Application for allocation must be made by supplient to the War Production Board.

Plyform is the special concrete-form grade of Douglas fir plywood—a quality grade manufactured with highly water-resistant glues and intended for multiple re-use. (As many as 15 re-uses for concrete forms have been reported.)

And in addition to the fact that it can be used again and again, Plyform offers these distinct advantages to the cement contractor:

1—**Joints are minimized.** The large smooth Plyform panels reduce joints and fins to a minimum, reducing leakage and finishing costs.

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3—**Smooth textured finish.** Both faces of Plyform are sanded to a satiny smoothness, and are non-absorbent. This gives a smooth finish that greatly reduces rubbing and finishing time.

4—**Reduced construction costs.** Plyform comes in 4 x 8 foot panels, ½" to ¾" thick—panels that are installed quickly and easily. Plywood is easily worked by hand or power tools, too, further reducing erecting and stripping costs.

5—**A variety of effects possible.** Plyform may be bent to moderate curves, and other special effects are quite simply achieved. And when the job is "set," the panels are easily stripped for storage and re-use.

You'll be interested in the detailed technical data now available. Send for "Concrete Forms of Douglas Fir Plywood."

DOUGLAS FIR PLYWOOD ASSOCIATION
Tacoma 2, Washington

New Steel Overpass In Burlington, Iowa

In spite of adverse wartime conditions, the Iowa State Highway Commission recently completed a structural-steel rigid-frame overpass in the city of Burlington to carry U. S. Route 34 over Osburn Street and the Chicago, Burlington & Quincy Railroad tracks. The contract work on this structure was begun on June 19, 1941, and all construction was completed in February, 1944. The big delay occurred in 1942, during which period it was impossible for the steel company to obtain the necessary materials to fabricate the superstructure.

The overpass is a steel rigid frame founded on concrete footings and shallow abutments which are supported by piles driven through the fills. The center bent is fixed to the concrete footings and the bent on each side rests on nested rollers. Each end of the bridge rests on cast-steel rockers set on the abutment. There are four spans, the end ones each being 120 feet long and the two intermediate spans, each 130 feet in length. The reinforced-concrete roadway is 42 feet wide, and there are two sidewalks, each 5 feet wide. Stairways were constructed on the slope of the east approach to provide for pedestrian traffic between U. S. Route 34 and Osburn Street.

The Jensen Construction Co. of Des Moines, Iowa, was the contractor for this project, and the structural steel was furnished by the American Bridge Co. The plans were prepared by the Iowa State Highway Commission under the direction of E. W. Blumenschein, Engineer of Bridge Design. R. W. Merritt was Resident Engineer for the State Highway Commission, of which Fred R. White is Chief Engineer.

A New Tool Holder For Use in Lathes

A new adjustable tool holder with a vise grip for use in lathes, shapers, and planers is announced by the Robert H. Clark Co., 9330 Santa Monica Boulevard, Beverly Hills, Calif. Complete adjustability makes possible the use of any of four or more sizes of tool bits in the same holder instead of requiring a separate holder for each size, thus saving the mechanic's time by enabling him to change bit sizes without changing holders. Models available are the 15-degree sloping cutter channel type and the horizontal or parallel channel type in both right and left-hand offset. Each type is available in several shank sizes.

In addition, the Clark tool holder has a special vise grip jaw which has a strong clamping action for holding the bit vertically and horizontally with pressure evenly distributed over the entire holder channel, thus preventing tool-bit breakage. It eliminates the possibility of a pocket or sag developing in the bottom of the holder channel which the manufacturer claims is a frequent source of trouble when tool bits are clamped with a screw contact at a single point. The shape and position of the head of this new tool holder affords the operator an unobstructed view of the tool-bit cutting edge.

A new steel rigid-frame overpass in Burlington, Iowa.

This same vise grip offers another important saving by rigidly and firmly holding very short tool bits, thus effecting economies by using up short tool bits which otherwise would be scrapped. Square, round, out-of-round, undersize or dual narrow bits for cutting-off or forming operations are all held equally rigid. These new Clark tool holders are especially suitable for using Stellite and other extra-hard cast-alloy tool bits, since the even distribution of pressure in the holder will prevent breakage of these brittle and expensive alloys which is frequently caused by single point clamping methods.

Complete information including sizes, prices, etc., may be secured direct from the manufacturer by mentioning this description.

Bert Hastings Dies

Announcement has been received of the death in Philadelphia on August 11 of Berthold Francis Hastings. Mr. Hastings, known as Bert Hastings to a wide circle of friends and professional colleagues, had been District Engineer for the American Institute of Steel Construction in Philadelphia since 1928.

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There's been a big change in
"MOUNTAIN MUSIC"

Today, the shrill shrieks of the steam donkey and the rumble of the logging train are giving way to the hum of diesel motors on truck and tractor. A new symphony is being written to the rapid tempo of war. Yes, mountain music is changing.

IN KEEPING PACE with the day's demands for greater production, Isaacson Engineers have made great strides in cable operation. Combined with the highly successful Isaacson Kable Power Unit you have greater flexibility, more power and smoother operation. All are units designed for and adapted to the grueling conditions found in the rugged Pacific Northwest. With ownership of Isaacson Tractor Equipment goes assurance of having the finest your money can buy, tailored to your particular make of tractor and built to stand up under the most severe and punishing work schedules. Compact, sturdy tools for winning the war and the peacetime construction to follow.

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Ritchotte Made Manager Of Contractor's Tool Div.

The Independent Pneumatic Tool Co., Chicago, Ill., has announced the appointment of Henry H. Ritchotte as Manager of the Contractor's Tool Division, with headquarters in Chicago. Mr. Ritchotte, who had previously been manager of contractor's tool sales at Philadelphia, Penna., will be in charge of distributor policies and appointments through district managers and will assist distributors in the sale and service of Thor rock drills, paving breakers, clay diggers, and related air tools.

Prior to joining Independent Pneumatic Tool Co., Mr. Ritchotte was a district manager for Johns-Manville Sales Corp., and had experience as a design engineer on municipal projects and as a sales manager for H. O. Penn Co., construction equipment distributor, New York City.

Army-Navy "E" Awards

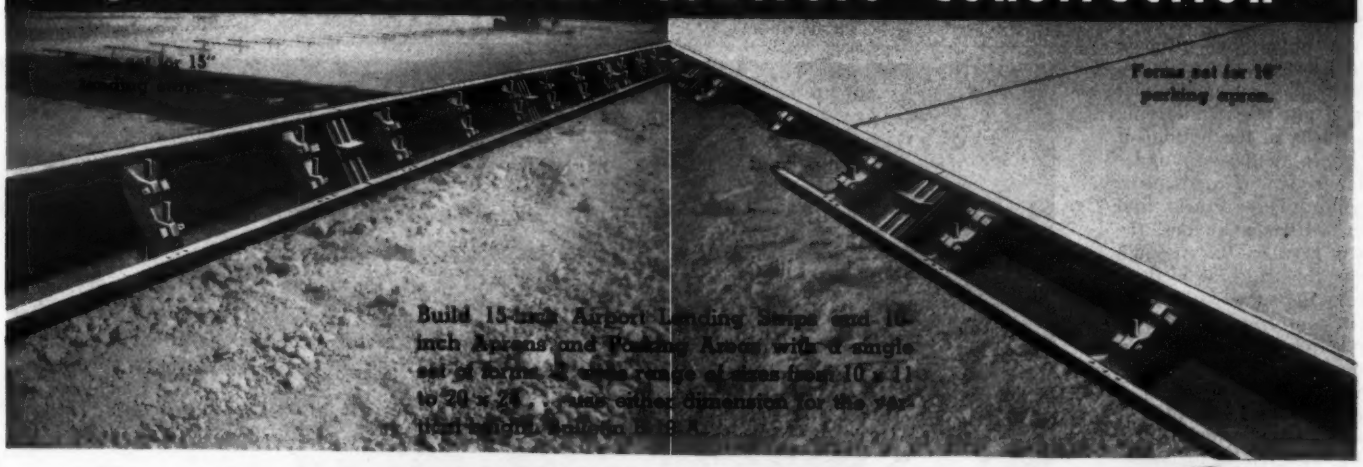
The Army-Navy "E" Award was made recently to E. D. Etnyre & Co., Oregon, Ill., in recognition of its war-production record. Nearly all of Etnyre's production facilities are devoted to war work, turning out Black-Topper bituminous distributors for constructing a network of naval bases, access roads and landing strips on all the fighting fronts, and sanitary street flushers which are used in military camps and naval bases throughout the world to help lay the dust, battle disease, and furnish extra supplies of water to our fighting men.

In recognition of continued excellence in war production, a star has been added to the Army-Navy "E" pennant awarded to the Raybestos Division, Bridgeport, Conn., last October. In accepting this second award, Raybestos officials paid grateful tribute to the company's distributors and customers whose encouragement and support have helped to make this achievement possible.

Asphalt-Plant Folder

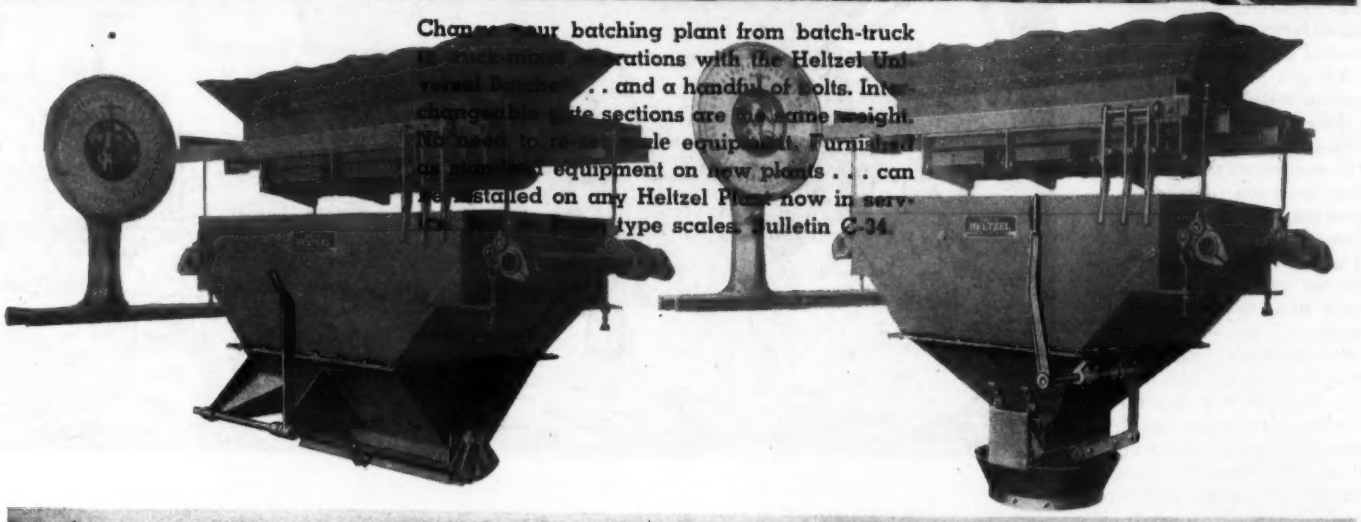
An interesting folder on the features of McCarter asphalt plants may be secured by interested contractors and state and county highway engineers from the McCarter Iron Works, Inc., Norristown, Pa. The features of these stationary or semi-portable plants include a telescopic drier for hot or cold-mix, the McCarter rugged pugmills of 1 or 2-ton capacities, and the specially designed non-tilting non-leaking asphalt buckets. They are equipped for steam or electric heat, and with electric-motor or diesel-engine drive, and are designed and fabricated to meet special job or site conditions.

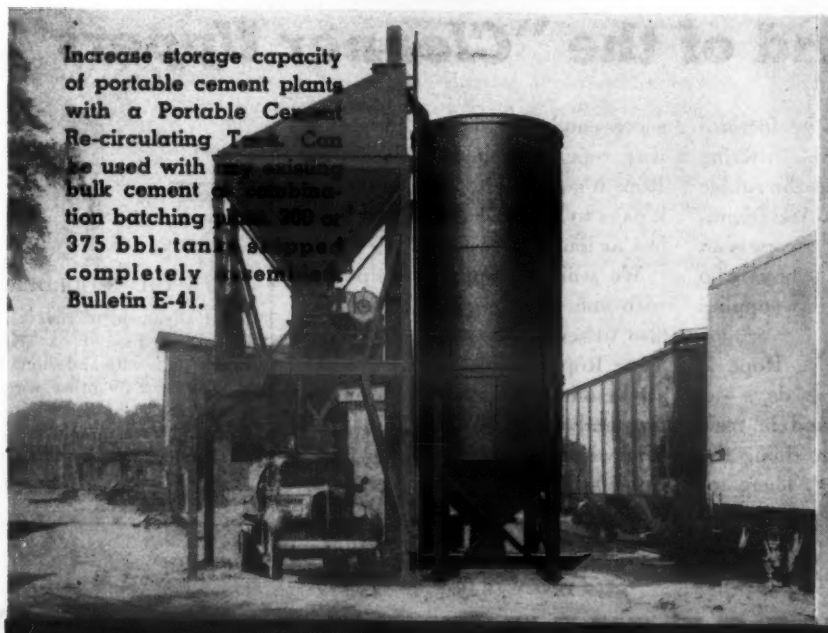
THREE WAYS HELTZEL Can Help You With Post War Concrete Construction



Build 15-inch Airport Landing Strips and 16-inch Aprons and Parking Areas with a single set of forms. A wide range of sizes from 10 x 14 to 20 x 24 . . . same either dimension for the variable height feature in H. S. F.

Change your batching plant from batch-truck [illegible] rations with the Heltzel Universal Batcher . . . and a handful of bolts. Interchangeable gate sections are the same weight. No need to re-set [illegible] equipment. Furnished as standard equipment on new plants . . . can be installed on any Heltzel Plant now in service. [illegible] type scales. Bulletin C-34.





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Soils Study Provides Highway Design Data

(*Continued from page* 18)

face of the specimen and gradually applying load to the contact area. For each disk or testing head, a record was made of the settlement produced as loads were increased, so as to obtain a record of settlement which would be produced by any given load. By plotting test results, the supporting value of the soil for any given settlement, and any desired contact area, could be rated in pounds per square inch for that area.

Sections of asphaltic-concrete pavement, nearly 2 feet square, were next constructed in the laboratory in thicknesses of 2 to 9 inches. Each section was placed on the surface of the reconditioned soil and subjected to the same type of loading test, with steel plates of various diameters, as previously described. It was noted that ultimate failure occurred when an almost cylindrical section of the pavement was punched through into the underlying soil. However, cracks in the bottom of the pavement began to develop under much lighter loads than were required for ultimate failure. These cracks first appeared when settlement under the testing head was between 0.5 and 0.6 inch and it was therefore decided to rate conservatively the supporting value of the pavement and soil together in terms of pounds per square inch required to produce a settlement of 0.5 inch directly under the loaded area. For any given loading area, the additional support furnished by a given thickness of asphaltic concrete, with reference to the underlying soil support, could be ascertained by subtracting the soil support at 0.5-inch settlement from that of the pavement resting on the soil.

Based upon these test results, thickness-design curves for asphaltic-concrete pavements with reference to soil or underlying base support were developed. Each curve represents a given unit load, expressed in pounds per square inch for tire contact areas, and these curves cover the range for truck tires which carry the heaviest total loads. To use these design curves, it is necessary first to ascertain by test the supporting value of the subgrade or base for the tire contact area of the heaviest vehicles for which the pavement is to be designed, because the rated support will vary with the area. Thus, if the design is for a tire contact area of 130 square inches, the load in pounds per square inch required to produce a settlement of 0.5 inch, when applied to this area, is taken as the subgrade or base support rating. If, for example, the subgrade or base rating is 30 pounds per square inch, and the maximum wheel load is 70 pounds per square inch, the design curves show that about 4.6 inches of asphaltic concrete should be constructed to carry this load satisfactorily. Certain mathematical formulae have been found which coincide quite closely with this entire family of curves.

Full-Scale Field Tests

So far as laboratory tests can tell the story, the engineers of The Asphalt Institute have confidence in these design curves, Mr. Hubbard reported, and have reason to believe that they are ultra-conservative. However, not content with laboratory tests only, the Institute engineers decided to clinch the solution of the problem by means of full-scale field tests. They further recognized the desirability of having commercially disinterested agencies participating in the conduct of such tests, and in drawing conclusions from them.

Therefore a proposal, with stipulations as to certain definite objectives, was submitted to the Highway Research Board for conducting a cooperative research project of considerable magnitude. The outcome was a general agreement, recently reached, by the Highway Research Board, the Public Roads Administration, and The Asphalt Institute, to conduct such an investigation as expeditiously as possible. The test results and conclusions to be drawn therefrom will be released through the Highway Research Board.

The broad objectives are as follows:

1. To obtain by means of field load-bearing tests on full-size pavement sections fundamental data on the load-supporting value of asphaltic-concrete pavements of various thicknesses, with respect to various base-course thicknesses and degrees of subgrade support;

2. To correlate such field test data with appropriate laboratory tests, with the purpose of determining whether or not the latter may subsequently be used by themselves as the basis for a sound method for the design of pavements of the non-rigid type.

The test pavements will be constructed out-of-doors with regular road-building equipment. Three widely different types of soil will be selected for subgrade support, and this will probably necessitate tests being made at three entirely different locations. For the first series of tests, an oval test track will be constructed with parallel tangents 800 feet long. The paved section of this track will be 40 feet in width, 10 feet of which will be re-

(*Concluded on next page*)

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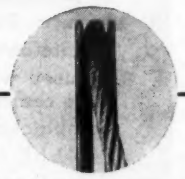

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Field Test Project On Soils and Paving

(*Continued from preceding page*)

served for moving-load tests, and the remainder used for static loading. Adequate shoulders will be provided. There will be four different thicknesses of gravel or broken-stone base course, the composition of which will conform with American Association of State Highway Officials' specifications for stabilized base course, and three thicknesses of asphaltic-concrete pavement, each thickness of which will be tested separately under static loading.

Static-loading tests will be made with five different-size bearing areas on subgrade, base, and pavement. These tests will be made on both unconfined surfaces and underlying surfaces with the surcharge that they carry under the completed pavement. These static loads will be applied by means of a hydraulic jack, operating against a heavily loaded steel truss spanning the pavement, and carried on wheeled cradles which can be moved into position on rails at the side of the pavement proper. Deflections under loading will be measured by dial gages.

The site of the first test track is at Hybla Valley, Va., not far from Mt. Vernon, on property belonging to the Public Roads Administration. Before selecting the exact site, a very thorough soil survey was made by PRA engineers who will be directly in charge of the investigation. A very uniform, but generally poor, soil has been selected for these tests, and in order to have subgrade conditions as uniform as possible this soil will be placed in the base of the testing track to a depth of approximately 5 feet. This soil is a red clay with over 90 per cent passing a No. 40 and over 60 per cent passing a No. 200 sieve, and contains over 20 per cent of colloids. Its plasticity index is over 25.

The composition and construction of the base courses will be developed by the PRA engineers to produce the best possible base from the materials used. Asphalt Institute engineers will design the asphaltic-concrete mix to be used, and will employ the stability test developed by the Institute as a design control measure. This test is used to evaluate resistance of the mixture to internal displacement. The mix to be used in constructing the large test track will be designed to have a stability suitable for heavy traffic.

Before the regular loading procedure to be followed throughout this investigation is decided upon, an attempt will be made to obtain some information on questions raised by a number of engineers. Practically all static-loading tests so far conducted have been made with rigid circular steel plates, and the question has been raised as to whether the transmission of loads through a pneumatic tire is comparable to the transmission through rigid plates, even when the bearing areas are the same.

On a special test section, comparative tests will therefore be run with a circular steel plate, a pneumatic tire, and a specially constructed circular flexible cell, all with the same contact area. The results obtained will influence the selection of the type of loading head which will be used throughout the principal investigation.

Another detail of the preliminary investigation will be to develop, if possible, a method for measuring the radius of critical deflection of the asphaltic-concrete pavement.

Moisture-Content Studies

In the conclusion of his discussion, Mr. Hubbard mentioned a very important part of this general investigation which is being handled directly by the Highway Research Board in cooperation with various state highway departments. This is concerned with the changes in moisture content which may be expected to occur in subgrade soils directly under impervious pavements.

It is recognized that the moisture content of a soil has a very definite effect upon its load-supporting value, and it is therefore important to design any pavement on the basis of the lowest support value that the soil is likely to have under service conditions. A number of state highway departments have accumulated considerable information on this subject, covering all types of soil under various climatic and other local conditions. The Highway Research Board is assembling as much of this information as possible and has assigned a research engineer to study these data, with the purpose of developing methods for its general application in highway design.

Copies of the complete discussion by Mr. Hubbard are available in pamphlet form from The Asphalt Institute, 801 Second Ave., New York 17, N.Y.

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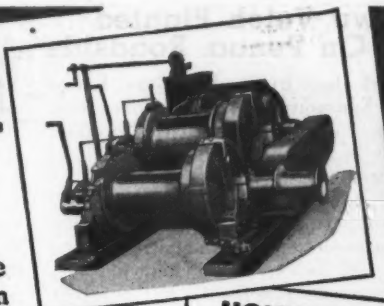

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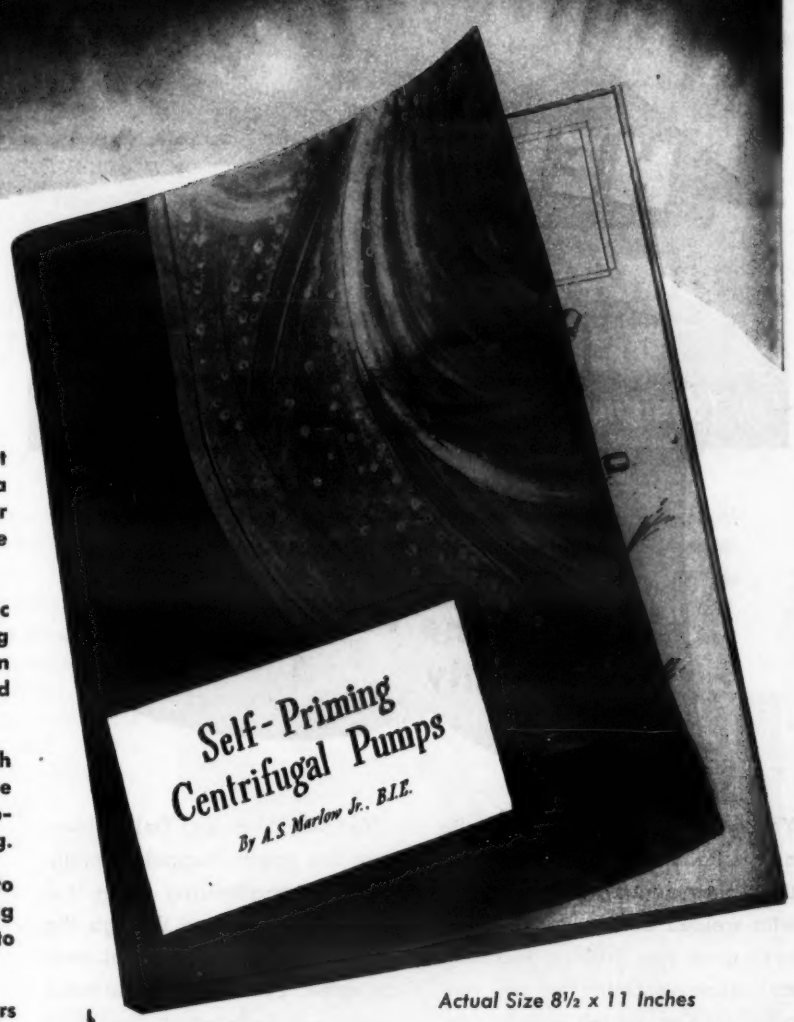

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Crown Vetch Planted On Penna. Roadside

Work done by Fred V. Grau, Extension Agronomist, Pennsylvania State College, with crown vetch (Coronilla varia) in roadside plantings has shown very good results. In the summer of 1943, at the beginning of a five-week drought period, a section of south-facing 40-degree slope was planted with crowns of Coronilla. An examination in June, 1944, showed practically 100 per cent survival with an excellent growth of blossoms appearing about June 5.

At the present time, the lack of crown-vetch seed necessitates vegetative planting, but Mr. Grau reports progress in the harvesting of seed so that in the next few years it is hoped to develop a sufficient quantity of seed to be able to include it in seed mixtures. This legume is slow to develop, and apparently it requires its own special inoculation which so far must be furnished through soil taken from the roots of established plants. It is not known that the inoculation has been developed commercially. As a plant for poor subsoils, Mr. Grau believes that it will fill a place in the northeast not now filled by any other plant. Once established, crown vetch has little equal as an erosion-control cover.

On July 28, about 10 pounds of crown-vetch seed was harvested by hand under the direction of Mr. Grau who states that his observations while harvesting this seed wholly substantiate the statements made above. The stand is nearly pure and, with suitable equipment, the entire vegetative portions of the plant, seed included, could be chopped for blowing on highway banks.

Timber Engg. Co. Opens San Francisco Office

To meet the increasing demand among architects and engineers for timber technical services on war and private projects, the Timber Engineering Co., Inc., Washington, D. C., has announced the opening of a San Francisco service and sales office in the Monadnock Building, with Alden K. Smith in charge. Mr. Smith was employed in the headquarters office of the company until two years ago when he was transferred to Portland to open a branch office in the northwest. A complete line of Teco connectors and grooving tools will be warehoused in San Francisco for immediate shipment, and warehouse stocks are also carried in Portland.

A product development shop and a wood chemistry laboratory have recently been opened by the company in Washington for the purpose of serving public and private agencies in better wood utilization and for the development of wood products generally.

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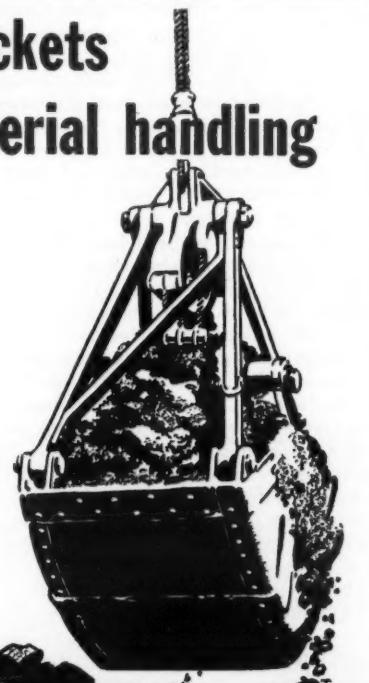

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Converting Britain To Isle of Airfields

Story of $3,000,000,000 Construction Program to Make Possible Allied Air Supremacy in Europe

By H. F. CHARRINGTON, G. C.
(Mr. Charrington, who is a B. Sc. (Eng.) of London University, has been engaged in airfield construction in various parts of the British Empire, including Malta, Palestine and Aden.)

(*Photos on page* 88)

✦ DURING the past four and one-half years, $3,000,000,000 has been spent on airfield and air-depot construction programs in Britain. Enough concrete paving has been laid down, to the disfigurement of her countryside, to provide a 9,000-mile highway 30 feet wide, or seven times the length of the Alaska Highway. All of this concrete is in runways, perimeter tracks and hard-standings capable of carrying any type of aircraft from the fighter up to the Fortress and the Lancaster heavy bomber.

To provide living, eating, workshop and hangar accommodation, over 1,000,000 prefabricated buildings, cut down to a few basic standardized types, have been erected. Electric cable used on Britain's wartime-built airfields reaches the amazing total of 336,000 miles.

This vast construction program, the biggest that Britain has seen in her long history, was organized by the Air Ministry and carried out almost entirely by civilian labor. Britain's largest jobs were let on a competitive basis, but all planning, design, specifications, and subsequent site supervision of contract work were done by the Air Ministry Directorate General of Works. This part of Britain's Air Ministry is run on a civilian basis, although under the general control of the Member of the Air Council for Supply and Organization, a serving officer of the R. A. F. of high rank, who also has under his control other Directorates run on a service footing.

Picture the British Isles as a vast intricate network of cities, towns, villages, highways, railroads, canals, farms, telephone cables, overhead electric-power transmission lines, not to mention many difficult topographical features, and you will get some idea of the difficulties of the site-finding and pre-planning stages of the program. All public interests had to be considered from the "war-effort" aspect before any site could be finally settled, and particularly those of food and housing — the latter, a problem made acute by enemy bomb damage and concentrations of population.

Start of the Program

During the summer of 1940, strategic needs of war in Britain dictated the policy of mass production of airfields, although during the preceding months many new airfields had been started. After the fall of France, it must be remembered, the English Channel, only 21 miles wide at its narrowest point, became the only barrier between Britain and Hitler's panzer divisions. Only about 30 miles separated the airfields of Britain and those in France occupied by the Luftwaffe. During the summer and autumn, which saw the Battle of Britain, and through the ensuing winter blitz period, Britain's Air Ministry took its coat off, got down to it and devised the means of mass construction on a scale never before attempted. The latest R. A. F. requirements and possible future requirements in airfields were studied. Type runway layouts were prepared and these were followed where topographical conditions permitted.

Building design for all the various needs of a fighting service had been studied ever since World War I and it was, therefore, mainly a matter of adapting the design of older types of permanent construction to new forms of the prefabricated variety.

With runways, however, things were different. Before this war, the rich grass of England provided all that was needed

(*Continued on page* 68)

An Austin-Western grader spreading hoggin (gravel with high clay content) on the subgrade of a runway at an airfield in Britain, preparatory to final compaction.

Signal Corps Photo

AN UNBEATABLE COMBINATION

This war has proved in a thousand ways the importance of teamwork; teamwork between army, navy and industry, between navy and air force, between artillery and infantry, between a soldier and his gun. Good men with poor equipment haven't been able to stand up to inferior men with better equipment. Good men *and* good equipment are unbeatable . . . on the fighting fronts, on the air bases, in the shipyards, in the quarries, in the metal mines, in the coal mines.

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Bailey Bridge Meets U.S. Engineer Needs

(*Continued from page* 21)

faction among the men to shove the bridge into place by hand, and that trucks are used only as a last resort.

With the bridge safely across, the nose is dismantled and the rollers are removed. The floor boards are fastened down by curbing, which serves as a guide should a vehicle suddenly swerve from its course. Foot walks, 2 feet 6 inches wide, are attached to the bridge on either side.

At the bridge school, one class of students put up two bridges, one 90 feet long and the other 100 feet, both of the triple single variety, in three hours. Both spans were tested by having a 30-ton tank run across them at high speed, then stopping and starting jerkily near the center. There was no evidence of strain on either bridge.

There is a limit to the length of the fixed bridge, as the longer it gets, without benefit of center supports, the less weight it can carry. However, to meet the need for longer spans, there is the Bailey floating or pontoon bridge which, theoretically, can be extended indefinitely, providing there are enough steel panels and other equipment available. The pontoons supporting the bridge resemble covered rowboats. These rectangular pontoons are linked together to form 60-foot pontoons or piers which support the bridge.

Moving sufficient equipment to a bridge site, as would be required under combat conditions, requires a fleet of trucks and trailers. The erection of a bridge such as those constructed at the school requires sixteen 2½-ton trucks and eleven pole-type 2½-ton trailers.

Peacetime Use

Mr. Bailey, who has been in bridge work for 16 years, points out that while the Bailey Bridge is being used now for combat, it is designed as a semi-permanent bridge and that with proper maintenance it will last many years. "A bridge of this type, easy to construct, also may prove of value after the war," he said, "particularly in countries undergoing development."

More Engine Power With Superchargers

Wartime emphasis on engine performance has greatly stimulated interest in superchargers, according to C. S. Davis, President of Borg-Warner Corp. While production today is devoted entirely to wartime needs, there lie ahead very interesting questions of reducing costs and increasing engine efficiency by means of supercharging wherever internal-combustion engines are used. The tendency towards lighter-weight engines will stimulate wider use of superchargers, in Mr. Davis' opinion. The purchase of McCulloch Engineering Corp., Milwaukee, Wis., by Borg-Warner and the change in name of McCulloch to B-W Superchargers, Inc., mark the entry of Borg-Warner into the supercharger field, another step in its program of diversification and expansion in the automotive, aviation, tractor, and marine fields.

The greatest advance in the use of the supercharger, "an air compressor for engines", has been in the development of airplane engines, particularly for high-altitude military planes. The war brought with it a need for large numbers of internal-combustion engines for stationary, marine, and transportation uses. The maximum possible power from these engines is obtained through superchargers which increases the power of the engine from 10 to 30 per cent and in some cases, considerably more.

J. P. Stewart, Assistant General Manager of B-W Superchargers, Inc., is doubtful whether the supercharging of passenger-automobile engines will come into general use. Balanced against the probable greater supply of high-octane fuels and the trend towards smaller and lighter engines is the natural reluctance of the public to accept what may be considered as an extra complication. Mr. Stewart believes a larger use for superchargers will be found in engines for private aircraft likely to be built in quantity after the war; also, that the large fields for supercharging in gasoline engines will probably be in the heavy-duty or "work horse" engines of 150-hp and up. Promising results have been obtained along this line and much further development is in progress, coupled with the trend towards higher-octane fuels, according to Mr. Stewart.

Worm-Gear Reduction Units

Users of worm-gear reduction units will find the new Catalog No. 300 issued by The Cleveland Worm & Gear Co., 3301 E. 80th St., Cleveland 4, Ohio, a helpful piece of literature. Following the explanatory and descriptive material which comprises the first portion of the book, the design engineer will find carefully detailed instructions for planning installations of Speedaire units, with illustrative examples and full details shown by means of cut-away photographs, charts, diagrams and tables.

Speedaire worm-gear reduction units are cooled by passing the heat generated during their operation through an oil bath to the deeply-finned wall of the reservoir. An exhaust fan on the coupling end draws a continuous stream of air at high velocity between the double walls that form the lower half of the unit, completely sweeping the surfaee and providing an effectual transfer of heat.

Copies of this catalog will be sent to design engineers writing direct to the company and mentioning this review.

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Syracuse — Syracuse Lumber Co.
Utica — McQuesde & Bannigan, Inc.
NORTH CAROLINA
Raleigh — Carolina Tractor & Equip. Co.
Salisbury — Carolina Tractor & Equip. Co.
NORTH DAKOTA
Fargo — Dakota Tractor & Equipment Co.
OHIO
Cleveland — H. B. Fuller Equipment Co.
Columbus — W. W. Williams Co.
OKLAHOMA
Tulsa — Leland Equipment Co.
OREGON
Portland — Contractors Equipment Corp.
PENNSYLVANIA
Philadelphia — Giles & Ransome
Pittsburgh — Bruno-Doyle Company
RHODE ISLAND
Boston, Mass. — The Equipment Co.
SOUTH CAROLINA
Columbia — Joel Hurst Steel Machinery Co.
SOUTH DAKOTA
Rapid City — J. D. Evans Equip. Co.
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Chattanooga — Rinco-Hassello Co.
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Dallas — Cooley-Lott-Nichols Mach. Co.
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Salt Lake City — Leland Machinery Co.
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VIRGINIA
Richmond — Rish Equipment Co.
Roanoke — Rish Equipment Co.
WASHINGTON
Seattle — Star Machinery Co.
Spokane — Empire Equipment Company
WEST VIRGINIA
Charleston — Rish Equipment Co.
Clarksburg — Rish Equipment Co.
WISCONSIN
Milwaukee — Hunter Tractor & Mach. Co.
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Seattle, Wash. — Northern Commercial Co.
CANADA
Montreal — Watson Jack & Co., Ltd.
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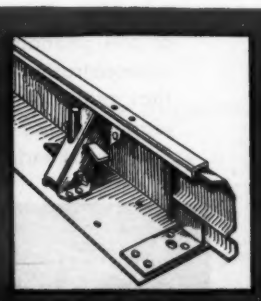
ON ROADS AND AIRPORTS
USE THE BLAW-KNOX
TRANSVERSE BLADE AUTOMATIC
CONCRETE PAVING SPREADER
AND THE
BLAW-KNOX FINISHING MACHINE
(EITHER MACHINE EQUIPPED WITH PAVING VIBRATOR IF DESIRED)

● Contractors prefer the Blaw-Knox Transverse Blade Spreader because of its enormous capacity for spreading concrete ahead of the finishing machine — its automatic spreading action regardless of where the concrete is placed on the subgrade — the absence of pressure on the side forms and avoidance of disturbing form alignment — freedom from job-interrupting breakdowns and excessive maintenance costs — does not segregate the concrete regardless of maximum size of aggregate — narrow machines are convertible to wider machines and vice-versa.

● Contractors also prefer the Blaw-Knox Finishing Machine because of the smooth finish obtained under maximum production conditions — wide screed ends prevent wastage of concrete over side forms — six traction speeds and four screed speeds give flexibility of operation to handle varying types of concrete — machine is easily and quickly adjustable for width — proper weight distribution makes machine easy on the side forms and easy to steer — low upkeep cost — easy to operate.

● The combination of the Blaw-Knox Finishing Machine and Transverse Blade Spreader has the capacity to handle the maximum output of two 34-E Dual Drum Pavers.

● See your nearest Blaw-Knox distributor about Blaw-Knox Finishing Machines and Blaw-Knox Transverse Blade Automatic Concrete Paving Spreaders for your next paving job.



Engineering Depts. Of Gar Wood Merged

The Engineering Departments of Gar Wood Industries, Inc., Detroit, Mich., heretofore scattered in four locations, have been brought together at the company's main plant at Detroit and will be adjacent to the Executive Offices. This centralization of the engineers of the Hoist & Body, Winch & Crane, Tank, and Road Machinery Divisions is another step in the overall program of this organization aimed further to improve its output of war goods and also to ease the transition to peacetime operation.

Prior to this announcement, Glen A. Bassett, President of Gar Wood Industries, had announced a revamping of the production set-up involving the creation of the post of vice president in charge of manufacturing.

Report of Discussions On Surplus Equipment

Last May there was held in Washington, D. C., a meeting of construction-equipment manufacturers to discuss with government officials the problem of surplus war construction equipment and its disposal at the end of hostilities. Five representatives of various government agencies, including Major-General Philip Fleming, Federal Works Administrator; W. L. Clayton, Surplus War Property Administrator; C. E. Mack, Director, Procurement Division, U. S. Treasury; Ernest L. Olrich, Director, Treasury Procurement Surplus War Property Division; and Brigadier-General Theron D. Weaver, Director of Industrial Mobilization, Army Service Forces, appeared on the program and discussed various phases of this vital problem.

The talks by these officials and the discussions and questions that followed them have been issued in a 48-page pamphlet by the American Road Builders' Association, International Bldg., Washington 4, D. C. Copies may be secured by sending your requests direct to the Association.

New Schramm Dealer

Arrangements have just been concluded by Schramm, Inc., West Chester, Pa., manufacturer of air compressors, for representation in the southern Idaho territory by the Western Equipment Co., 4009 Fairview Ave., Boise, Idaho. This well known equipment distributor will have Schramm units available for sale or rental, and will also provide complete servicing and repair facilities for Schramm users in that vicinity.

Speed Quality Paving Production

- Pick for your job the machines that have made good on the world's toughest proving grounds, paving air bases and roads for the armed forces on every front.
- New points in design and construction, war inspired, will be found in the Blaw-Knox construction equipment you'll be using for post-war construction.

The Blaw-Knox Transverse Blade Automatic Concrete Spreader and the Blaw-Knox Finishing Machine illustrated are paving the Queens Highway — the main east and west route in Ontario, Canada. The old pavement had disintegrated under heavy war traffic. Both machines are adjustable from 20 to 25 ft. widths. Photo shows paving operations on super elevated curve, 22 ft. width of slab.

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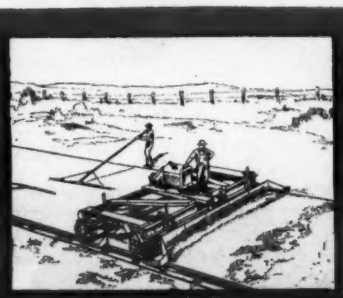
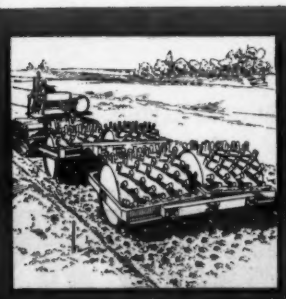

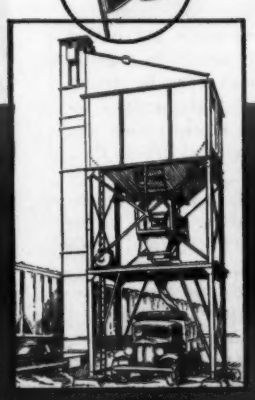

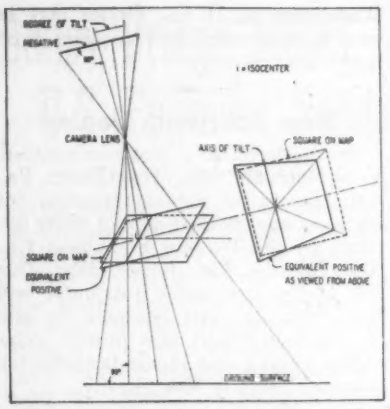

Figure 2. The tilt of the airplane and fixed camera, when a photograph is taken, causes displacement of points on the ground, increasing towards the edge of the photograph.

Maps Made to Scale From Aerial Photos

(*Continued from page 27*)

not in their true position because aerial photographs are perspective views. The effect is zero at the center of the photograph, increasing radially from the center. For example, a point 500 feet above the datum plane and 3 inches from the center will be displaced 0.15 inch when the picture is taken at a 10,000-foot elevation.

Displacement of position due to the airplane being tilted at the instant the photograph is taken is shown in Figure 2. Air currents and bumpy air, especially at low altitudes, make it impossible for planes to fly exactly level. Recent improvements in camera mounts have reduced to some extent the taking of photographs in a tilted position. This displacement is zero at the center of the print, gradually increasing the scale on one side of the photograph, and gradually decreasing it on the other. A point 3 inches from the center, and taken when the tilt is 3 degrees, will be less than 1/16 inch off. On contracts for area flying the maximum allowable tilt is usually specified. This tolerance is controlled by the size and the scale of the photographic negatives. For pictures 10 inches square made to a scale of approximately 1 inch equals 1,500 feet and taken at an altitude of 10,000 feet, the allowable tilt from the horizontal is about 2 degrees. Some aerial cameras record on the margin of the print the altitude and the degree of tilt when the photograph is taken.

The change at the center portion of the print is very small; therefore, when scaling from photographs is necessary, such measurements should be confined to the center portions. With the overlapping of pictures, every point on the ground will be somewhere near the center of one of the adjacent prints.

Making Maps to Scale

Recognizing the value of these center portions, photogrammetric engineers have devised a system for preparing maps to scale. These maps are called mosaics. Mosaics are made by cutting out the central portion of each picture and matching these central portions together. Prints that were taken when the plane was tilted are rectified before they are used. Essentially, this consists of placing the photograph in its tilted position and rephotographing it so as to restore the picture to its vertical position.

Mosaics are divided into two types, controlled and uncontrolled. Controlled mosaics are the most accurate maps possible from aerial photographs. On them the distance between certain identifiable points on the pictures are measured on the ground. These points are accurately plotted on the board and the corresponding points on the prints placed directly under them. The accuracy of the mosaic depends upon the topography. This type requires good ground control both horizontally and vertically. The amount of field work necessary varies with the terrain and with the desired accuracy of the finished map. The more rugged the topography, the more control required.

On uncontrolled mosaics these central portions are glued on the board by carefully matching the topography. Uncontrolled mosaics are made without any ground control, and are usually made where the area is inaccessible for field work, such as in uninhabited areas of South America, territory under enemy control, or where sufficient funds are not available. Some measure of control may be obtained by using plans of existing highways, railroads, or other points whose position is known.

Mosaics cannot be used to see relief. Their chief usefulness is where scale measurements for property lines, drainage areas, or distances are required. They are also very useful in field recon-

(*Continued on next page*)

FOR QUICKER, SAFER FALL CONCRETE

USE SOLVAY CALCIUM CHLORIDE

At temperatures below 50° F. the development of strength in concrete is seriously slowed up—which in turn holds up finishing and increases operating costs. The addition of Solvay Calcium Chloride to concrete mix offsets the dangerous effect of low temperatures by accelerating set and increasing early strength. This means shorter protection period . . . quicker finishing and release of forms . . . and concrete that is denser, stronger, more waterproof.

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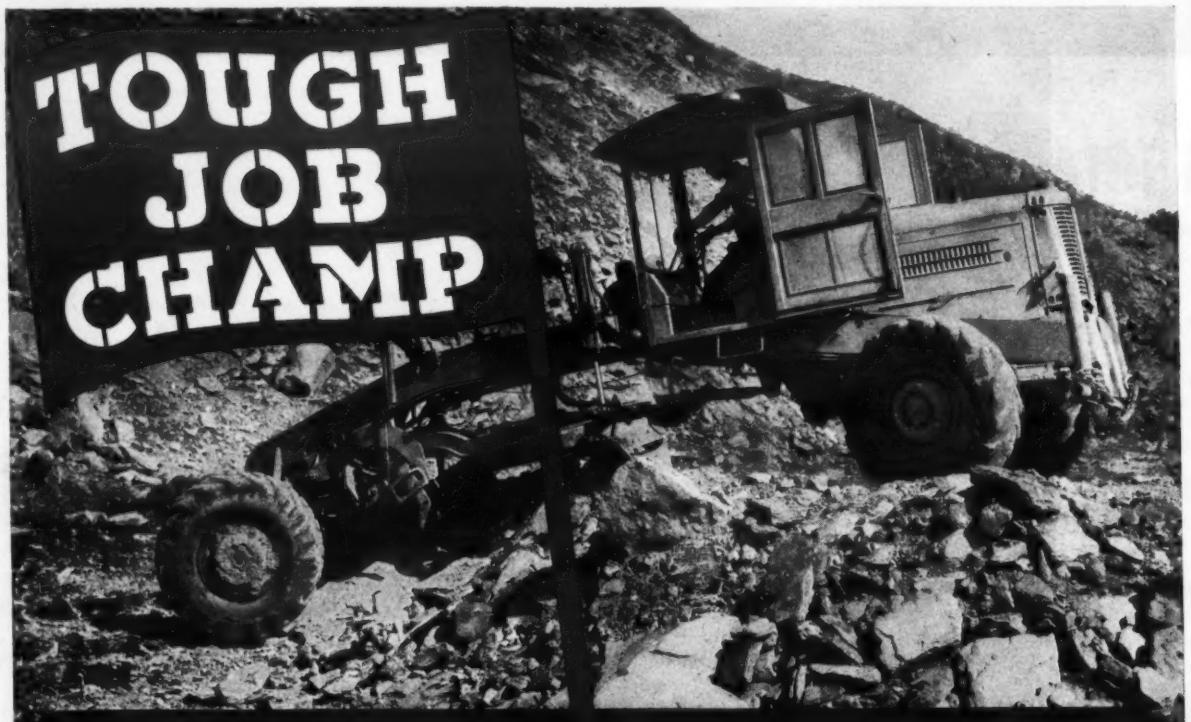

Take any job on which there are motor graders of various types . . . a job on which there is real pioneering to be done . . . in rocks, sand or mud . . . or on steep slopes. Which machine do you find up front where the going is roughest and toughest? The Austin-Western 99-M Power Grader.

IT HAPPENS EVERY TIME . . . and there's a good reason. No other motor grader can match the all-around, rough-and-tumble performance made possible by the 99-M's exclusive All-Wheel Drive and All-Wheel Steer.

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AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U.S.A.

BUY MORE WAR BONDS

Using Air Photographs For Highway Surveys

(*Continued from preceding page*)

naissance for marking routes or classifying soils.

It is essential to have an index map in order to identify and locate the pictures needed. The pictures are assembled and matched by fanning one over the other and are tacked to a board, as shown in Figure 3. A picture is then made of this map which serves as an index, making it possible readily to pick out the pictures required for any one area. For highway reconnaissance or location, the terminals are clearly indicated by a china marking pencil. Any intermediate control points are marked and lines drawn between terminals through these points. Pictures are then selected along the general route and studied under the stereoscope. Highway location studies are made on the contact prints. These are prints from negatives of the aerial camera and viewed through a stereoscope.

With the stereoscope, two different views of the same object are seen separately, one with each eye. The slightly different view of each gives depth to the object, causing the relief to stand out. The third dimension is obtained only on overlapping portions of the prints.

Stereoscopes are divided into two general classes, mirror type and lens type. The lens type magnifies the area but coverage is small. Therefore, it is usually used when more detail is required. This type also distorts vertical dimension, especially around the perimeter of the lens. It causes slopes to appear steeper or flatter, depending on the lens position, and gives a dish effect to the landscape. Study with this type should be confined to small areas vertically beneath the lenses with the stereoscope shifted around as necessary to obtain greater coverage.

The mirror type does not magnify, but it covers a larger area. The mirrors may be either fixed or movable. The adjustable type is more satisfactory for viewing large photographs because it can be adjusted to prevent one picture covering the other, thereby concealing the corresponding image. The only physical requirement necessary to use this type is that both eyes be of equal strength, or be corrected with glasses. The mirrors should be equi-distant from the eye piece so that the objects will be the same size, since size varies directly as the distance.

Two adjacent pictures of the same flight are selected. These pictures are then roughly matched, by fanning, to determine the correct position of the two photographs. Next, the index finger of each hand is placed on similar points and the prints are moved apart until the two fingers appear as one under the stereoscope. Then, corresponding points on one edge of each print are observed and moved until stereoscopic action is secured. Observe another point in the opposite edge and adjust if necessary. The pictures are now roughly in their correct position and may be used for casual stereoscopic inspection when kept flat.

Figure 3. An index map of aerial photographs.

For lengthy periods of inspection, it is desirable to have the photos absolutely in their correct position to eliminate eye strain. The photographs are in their correct position when the eye line is parallel to the line joining the principal points of the photographs. The eyes will tolerate some rotation but it causes strain, making it very uncomfortable to view for any length of time. To orient the photographs correctly, the principal points on each picture must all lie in one straight line, as shown in Figure 4. This set-up procedure is the same for the lens type or the mirror-type stereoscope, the only difference being the distance separating the photographs. For the lens type, the distance between the principal point on the left picture to its image on the right picture must be equal to the distance between the eyes of the viewer. This is called interpupillary distance. In the fixed-mirror type, this distance is a constant and is usually noted on the instrument. In the movable-mirror type the distance varies with the distance between mirrors. If when orienting the prints they are pushed together, crossing over the hands until the prints again are in correspondence, inverted relief will be obtained. The streams will appear as ridge lines and hills as sinks. This is sometimes useful in tracing out stream beds, since they are more sharply defined when inverted.

Locating the Highway

We are now set up to trace out the

(*Concluded on page 73*)

TELSMITH

CRUSHING AND SCREENING PLANT

U. S. Army Engineers are building a huge dam in Tennessee. It will require 1,500,000 tons of aggregate—4 sizes of crushed rock: 3″- 6″, 1½″- 3″, 3/16″- ¾″, minus 3/16″; and one size of sand.

To produce this material, Ralph E. Mills Co., of Roanoke, Va., opened a quarry at the dam site. The rock is a high calcium limestone. Telsmith designed the complete crushing and screening plant, and furnished most of the equipment. Capacity is in excess of 200 tons per hour.

On war jobs, equipment as well as men must produce more *and faster* without "cracking" under the strain. For years Telsmith has been building equipment that can turn it out, without taking time out. Telsmith complete sand and gravel and rock crushing plants are a *known quantity* to miners, contractors and aggregate producers.

That's why Telsmith gets the call on so many war jobs—to build army and navy air bases, dry docks, roads, dams, and other big construction projects.

That's why your Uncle Sam is now taking most of the Telsmith equipment being built. It's going overseas, to build for the armed forces' needs.

You can get Telsmith equipment—for war work now—and after the war for all your needs. Get Bulletin Q-34 today. Q-9

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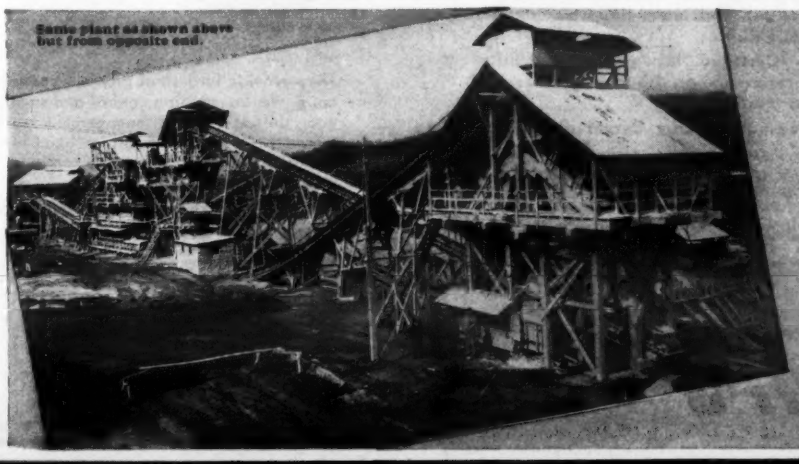

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Quarry Plant Equipment

One 48″ x 12′ Telsmith Heavy-Duty Apron Feeder
One 36″ x 180′ Telsmith Belt Conveyor
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One 36″ x 182′ Telsmith Belt Conveyor
One 16-B Telsmith Primary Breaker
One 24″ x 78′ Telsmith Belt Conveyor
One 24″ x 75′ Telsmith Belt Conveyor
One No. 48 Telsmith Gyrasphere Secondary Crusher
One 36″ x 131′ Telsmith Belt Conveyor
Two 4′ x 12′ Telsmith Double Deck Pulsator Screens
Two 18″ x 21′ Telsmith Belt Conveyors
Two 4′ x 10′ Telsmith Single Deck Pulsator Screens
Twelve Telsmith Bin Gates
Three 18″ Telsmith Belt Conveyors
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A complete line for every type of Rock Drill, Pavement Breaker and Clay Digger.

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Two New Pamphlets On Asphalt Paving

Two 16-page pamphlet reprints of papers presented at the First Illinois State Asphalt Conference, held in Springfield, Ill., last February, have been issued by The Asphalt Institute. These are Construction Series No. 69, "Construction and Resurfacing of Primary Highways", by Bernard E. Gray, General Manager and Chief Engineer of The Asphalt Institute, and Research Series No. 10, "Soil Bearing Tests and Flexible Pavement Design", by Prevost Hubbard, Chemical Engineer for the Institute.

The first, dealing with construction and resurfacing and containing highway construction illustrations, presents the subject under the following subheads: post-war requirements, recapitulation of developments in asphalt construction, resurfacing old portland-cement concrete, asphaltic concrete for patching and widening, modern equipment, aggregates, thickness, color and texture, cost as influenced by volume of work, side forms or curbs, and summary.

"Soil Bearing Tests and Flexible Pavement Design" is divided into a review of laboratory tests and a statement of the broad objectives of the present field load-bearing tests being carried on cooperatively by the Highway Research Board, the Public Roads Administration, and The Asphalt Institute.

Copies of these pamphlets may be secured without charge direct from The Asphalt Institute, 801 Second Ave., New York 17, N. Y.

Insley Names Dimond As New Sales Manager

The appointment of George J. Dimond as Sales Manager of the Insley Mfg. Corp., Indianapolis, Ind., has been announced. Mr. Dimond, who succeeds Ray W. Dorward, retired, is well known in the construction equipment industry. For the past 25 years, he was associated with the Koehring Co., rising through a variety of positions to the post of Sales Manager.

Mr. Dimond has taken an active part in numerous national organizations of equipment manufacturers, dealers, and contractors. He has been a member of the American Road Builders' Association since it was founded and, for the past five years, has been a director of its Manufacturers Division. He has also been active in the affairs of the Associated General Contractors' Mixer Manufacturers Bureau and for the past two years has served as its Chairman.

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Carver Certified Pumps can save you many hours and dollars on your pumping jobs. Lifetime tungsten carbide seal, special long life impeller and removable liner, and trouble-proof design enable Carver pumps to handle water filled with mud, grit or sand and there will be less time out for maintenance. Low first cost, fast priming, efficient, non-clogging action, mean that Carver pumps get to work faster, stay on the job longer, and, most important of all, pump more water at less cost per gallon.

Every Carver pump carries a "Certified" tag—proof that it fully meets our high standards for performance on the job—your assurance of top performance on your toughest jobs.

For complete information, see your nearby Carver distributor or write direct.

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Williams Buckets have been famous for their many fine mechanical details for nearly 40 years. Since 1931, Williams Buckets have been built by Wellman.

WELDED CONSTRUCTION, featured in Wellman custom-built buckets, which made them so predominant in heavy duty steel mill service, is now applied to all

Wellman-Williams Buckets
FOR LONGER SERVICE WITH LESS MAINTENANCE COST

Built in Multiple Rope, Power Arm, and Power Wheel Types in ⅜ yd. to 16½ yd. capacities.

SEND FOR FREE BULLETIN. Tell us about your particular requirement and we will send full description of construction and features in special bulletins which clearly prove why YOUR NEXT BUCKET SHOULD BE A WELLMAN.

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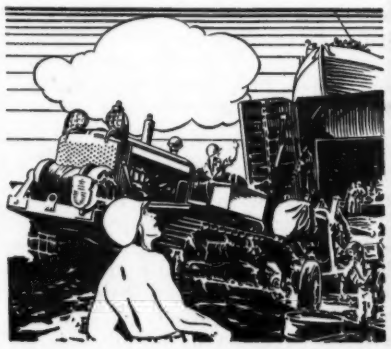
HOW DIESEL TRACTOR Power Transmission WILL HELP GIVE More Horsepower To TOMORROW'S TRUCKS

Hauling heavy equipment up sandy beaches, filling in shell craters and brushing away jungle growth has developed clutches that will enable tomorrow's truck trains to haul the heaviest loads over the roughest roads. Let our engineers show you how you can improve your post-war models by using these



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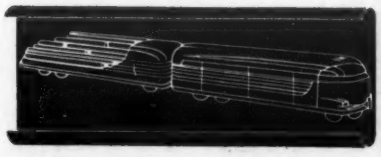
SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION CONTRL

It shows HOW the construction advantages of ROCKFOD CLUTCHES and POWER TAKE - OFFS have been utilized to solve power transmission problems in a wide range of industries. It gives capacity and dimension data. Contains application diagrams. Don't wait until ready to go into production before getting this useful bulletin.

They provide for instant pick-up, convenient power transmission control and smooth gear shifting—with disengagement maintained by light foot-pedal or hand-lever pressure.



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▼ 314 Catherine Street, Rockford, Illinois, U. S. A. ▼

Pullmore Multiple-Disc Clutches • Over-Center and Spring-Loaded Clutches • Power Take-Offs

This Year's Roadside Work in Connecticut

(*Continued from page* 8)

rock cuts and roadsides, collection of refuse, paper, bottles, etc., will continue to be essential maintenance items, as will the spraying of trees along the highways to keep down insect pests. The Department has nine high-powered spray outfits to complete this task.

The roadside maintenance expenditures on the approximately 3,000 miles of state highways in Connecticut for the fiscal years from 1938-39 to date have been as follows:

1938-39	$668,466.00
1939-40	493,871.00
1940-41	442,495.20
1941-42	396,322.00
1942-43	295,461.14
1943-44*	290,000.00
1944-45**	289,100.00

*estimated **appropriation

The average force-account unit costs for the various development activities of the Bureau of Roadside Development in Connecticut are as follows:

Rough grading	$ .10 per sq. yd.
Excavation, earth	.50 per cu. yd.
Excavation, rock	5.00 per cu. yd.
Furnishing and placing loamy topsoil	.60 per cu. yd.*
Furnishing and placing borrow	.50 per cu. yd.
Furnishing and placing gravel	.50 per cu. yd.
Furnishing and placing crushed stone	1.25 per cu. yd.
Furnishing and installing sod	.60 per sq. yd.
Finish-grading, fertilizing and seeding	.05 per sq. yd.
Furnishing and placing picnic tables	9.00 each
Plain cobble gutter, installed	.75 per sq. yd.
Penetration open ditch, installed	.60 per sq. yd.
Open drainage ditch, installed	.25 per lin. ft.
Stone underdrain, installed	.80 per lin. ft.
Asphalt-coated corrugated-metal culvert pipe, 6-inch perforated, installed	2.25 per lin. ft.
Field-stone curb, installed	.60 per lin. ft.
Removal of old pavement	.50 per cu. yd.
Removal of old stone wall	.20 per lin. ft.
Rubble masonry wall, installed	9.00 per cu. ft.
Terrace construction	12.00 each
Furnishing and installing double-unit outdoor toilet	175.00 each
Furnishing and installing fireplace	18.00 each
Furnishing and installing low wooden guide rail	.35 per lin. ft.
Furnishing and installing plank berm	.06 per lin. ft.
Furnishing and installing metal drop inlet	3.00 per lin. ft.
Furnishing and installing catch basin	65.00 each
Tree well, installed	12.00 each
Aeration of tree root system	10.00 each
Selective thinning and cutting of existing growth	300.00 per mile
Clean-up of roadsides	200.00 per mile
Furnishing and placing mulch	.05 per sq. yd.
Engineering and supervision	2 to 5 per cent

*This cost rises to as high as $1.00 on long hauls.

The estimated expenditure for the fiscal year 1943-44 is $465,000, of which $290,000 is for roadside maintenance, as described above, and $175,000 for roadside development. For the fiscal year 1944-45 the estimated expenditure is $386,000, $289,100 for roadside maintenance and $97,000 for roadside development.

1944 Field Work

The roadside-development work for the current year in Connecticut will include the completion of slope stabilization on all construction contracts which were finished in the last year and several of which have been carried over into 1944. There are between fifty and sixty projects, many of which are from 60 to 80 per cent complete but need some seasonal activity. Most of these will be completed during the current season. This work consists mainly of slope stabilization by the installation of some slope drainage, mulching, loaming and seeding. Most of the mulch is secured from roadside mowing, but some poor hay which has gone sour is purchased where the price is sufficiently low.

The slope drainage program in Connecticut started in 1934 with French drains in the face of the slopes. This was later changed to the use of agricultural tile and vitrified-clay bell tile and finally to asphalt-coated corrugated-metal perforated pipe which has been found to be the most satisfactory solution to this problem. The pipe is usually installed with the perforations up.

Cooperative Efforts

As soon as any new highway location is decided upon, a Landscape Engineer from the Bureau of Roadside Development goes over the project and makes suggestions as to alignment in order to save trees or to increase the scenic effect.

Six-inch tile set vertically in a bed of gravel for the aeration of a tree root system on a Connecticut highway. The balance will be loamy topsoil over a mulch. This work was done by Bureau of Roadside Development forces before construction which involved a fill.

Great stress is laid on the conservation of topsoil in Connecticut and on every project one will see stockpiles of topsoil made by the contractor and left for the use of the Roadside Development Bureau in their later work.

Considerable time is spent working with the Engineers of Location, Design and Construction, as well as with the Right-of-Way Engineers, in order to secure the most economical results on the completed highway.

An interesting example of cooperation with the Right-of-Way Engineers which greatly aided the state in the acquisition of much-needed right-of-way was cited by John L. Wright, Director. A house had to be moved from its location, but the owner was loathe to give the state a release because he had planted ten years before a Euonymus vine (winter creeper) which made a most pleasing display on his brick chimney. A roadside crew excavated the roots of the vine, packed them in burlap and boxed them so that the vine was moved with the house and is now growing luxuriantly at its new location, much to the delight and satisfaction of the owner.

The Gandy Bridge across a neck of Tampa Bay has been taken over by the Florida State Road Commission, acting jointly with the FWA, and has been freed of tolls.

TRU-LAY Preformed saves time. Yes, this rope saves time—the most vital commodity in industry, the most important factor in winning the war.

TRU-LAY saves time by reducing the number of shutdowns for replacement. That's because it lasts longer.

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West Virginia Plans Road Modernization

Post-War Work, Now Being Designed, Aims to Correct Width, Grade and Alignment; $8,000,000 in Plans Ready

By ERNEST L. BAILEY, Commissioner, State Road Commission of West Virginia

✦ IN West Virginia all rural highways, both primary and secondary, are under the jurisdiction of the State Road Commission. In 1933, county and district roads were taken over by the state, whose responsibility also extends to those parts of the primary system which are within municipalities. Therefore, the state system is large in relation to the area of the state. There are about 33,000 miles of roads, of which 4,800 miles are on the primary system and the balance on the secondary.

The standards of construction used in the paving of roads in West Virginia have always been governed by the needs of the times and financial limitations. The topography of the state is extremely rugged. Proper alignment and widths and acceptable grades, as we know them today, require heavy excavation. It is not surprising, therefore, that in the days of the 35-mile-per-hour speed limit, and before the advent of modern cost-cutting road machinery, roads followed the crooked course of contours and meandering streams. This was particularly true of those constructed by the county courts. To have built them otherwise would have been financially impossible, except by severe limitation on the mileage constructed, which would not have been in the best public interest. At that time the problem was to provide all-weather transportation facilities from one community to another, and not to build a few miles of what would then have been considered a super-highway to dead-end a short distance from town.

The Post-War Program

This brief historical sketch is given to clarify the following comments on our post-war program. There will be some reconstruction, of course, most of which will take the form of strengthening existing bases, widening, applying heavier surface treatments, and stabilizing shoulders, operations which border on super-maintenance rather than reconstruction.

When one of our roads has reached the stage of being worn out and requires complete rebuilding, then it is usually advisable to relocate it to secure better alignment and grades. Hence, the major part of our post-war construction will be on new locations following in general the old routes and utilizing such parts of the existing locations as will fit into a modern highway.

We have set up a post-war program of highway construction of an estimated value of $66,044,700 and involving 893.3 miles. From the standpoint of engineering and financing, this program falls into three categories.

First is the shelf of projects of a value of some $19,000,000, surveys and plans for which were in various stages of completion at the time that the outbreak of war stopped normal construction. For ready reference, we call these "pre-war" projects.

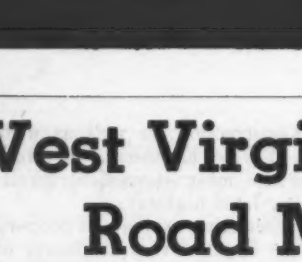
Second is the "Advance Engineering" program. Under the terms of the Defense Highway Act of 1941, West Virginia was allocated $109,600 of Federal funds to be matched by the state for surveys and plans for future construction. This we estimate will yield a construction volume of $14,770,000.

Third is the post-war program made possible by the Congressional Act of July 13, 1943, which provided for the use, within certain limits, of unobligated Federal-Aid, Federal-Aid secondary, and grade crossing funds, for surveys and plans. This meant, in effect, the transfer of these funds from construction to engineering purposes. Under this Act, West Virginia has set aside $474,750 to be matched by the state, giving a total of $949,500 for engineering. Among the projects in the program, we have included the engineering of those pre-war projects which had been started and not completed. The reasons for this were first, that they naturally had that priority status, and secondly, that being partly finished, they would yield us the greatest volume of plans in the shortest time.

In our post-war program, we shall continue our policy of gradually extending the mileage of multiple-lane highways, as increased volume of traffic warrants the extra expenditure. Of the 893.3 miles set up, 46 miles will be of four-lane highway design, and 55.8 miles are on the recommended Interregional Highway system. There are no expressways in cities, as that term is generally used in connection with elevated or depressed highways in the large metropolitan areas.

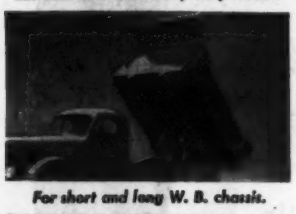
This does not mean that there are no bottlenecks within municipalities. Many West Virginia cities are located in very narrow valleys, where suitable building

(*Continued on page* 74)



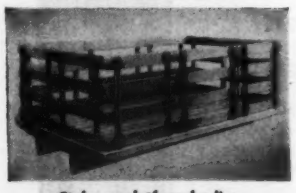
ANTHONY HYDRAULIC TRUCK EQUIPMENT

Six wheelers and heavy duty trucks.



For short and long W. B. chassis.

Special for wooden bodies.



Stake or platform bodies.

Solves manpower problem.

"SUPER" HYDRAULIC HOIST DUMP BODIES
sizes 5 to 30 ton capacity.

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MODEL "ZB" PLATFORM HOISTS
make dump bodies out of flat-bed, stake, or grain bodies.

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"STAKE BODIES"
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Lengths up to 20 feet.

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"LIFT GATE"
HYDRAULIC tailgate lift for loading truck van bodies, platform bodies, etc. One man does the work of three!

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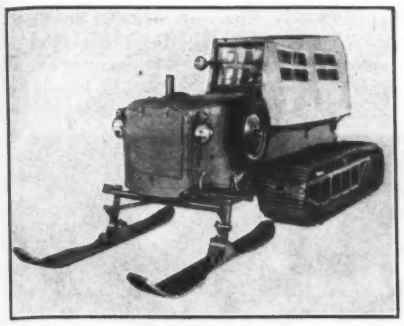
During 25 years of *continuous* production Briggs & Stratton has built more than 2,000,000 air-cooled 4-cycle gasoline engines. We are now well started on the 3rd million. Their trouble-free performance, easy starting and economy have made Briggs & Stratton leaders in the field—"preferred power" everywhere. BRIGGS & STRATTON CORPORATION, Milwaukee 1, Wisconsin, U. S. A.



The new Allis-Chalmers snow tractor.

A Motorized Buggy For Winter Travel

The Tractor Division of the Allis-Chalmers Mfg. Co., Milwaukee 1, Wis., in cooperation with the U. S. Army Ordnance and Army Air Corps, has announced the development and manufacture of a special snow tractor, Model M-7, and a 1-ton snow trailer, Model M-19, which are making their appearance regularly with our armed forces in Alaska and the Aleutian Islands.

Since the front axle of the snow tractor can be equipped with either wheels or skis, the tractor-trailer outfit is especially suited and practical for either snow or highway travel. Long wide tracks with rubber-faced shoes spread the tractor's weight and prevent its sinking into the snow, at the same time assuring maximum traction under all conditions, the manufacturer reports.

This snow tractor and trailer were initially constructed as a rescue-squad combination which could speed over snow-covered topography to aid downed pilots and their crews. The trailer was especially equipped for this purpose by the Air Corps, containing two litters, a heater and a heavily insulated canopy top. In addition, the outfit serves as a means of hauling supplies to forces stationed at distant points. Highway departments in the snow belt, faced with the problem of snow plows stuck in deep drifts in mountain passes or of rescuing the occupants of passenger cars during heavy snowfalls, would find such an outfit very useful. The trailer could be fitted up, not only to provide heat and some hot coffee for those suffering from exposure and fatigue, but could also be equipped as an emergency repair shop so that snow-plow breakdowns could be taken care of on the spot.

The tractor, which is powered by a 4-cylinder 4-cycle gasoline engine developing 63 hp at 3,900 rpm, has six forward and two reverse speeds, ranging from 4 to 41 miles an hour. Reverse speeds are 3 to 11 mph. Because of its low center of gravity, the tractor can climb slopes as steep as 45 degrees, it is reported. The trailer has a load capacity of one ton, while the unit itself weighs 640 pounds, including the insulated canopy top. Power for the lights and heater is supplied by the tractor which seats two men and is provided with a curtain enclosure for low-temperature operation. The engine is also "winterized" with a heavily insulated hood cover and a special engine preheater to assist starting.

New A-C Electrode

A new general-purpose electrode for mild steel, designated as Fleetweld 35 and made specifically for operation on alternating current, has just been announced by the Lincoln Electric Co., Cleveland, Ohio. This new shielded-arc electrode, which will also operate on direct current with either polarity, depending upon the type of work being done, has all the characteristics of the other Fleetweld electrodes for high-speed welding of single or multiple passes for work in flat, vertical, or overhead positions.

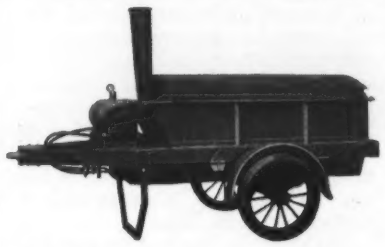
Available in 1/8-inch, 5/32-inch or 3/16-inch sizes, Fleetweld 35 conforms to American Welding Society specifications for arc welding electrodes Classes E-6010 and E-6011, is made in the standard 14-inch lengths, and is packed in 50-pound containers.

New Cement-Plant Bulletins

Two new bulletins describing and illustrating Johnson portable cement plants have just been issued by the C. S. Johnson Co., Champaign, Ill. One of these is devoted to the Johnson Dutchmill bulk-cement plant, especially designed for use on concrete-paving jobs, and the other deals with the Johnson Roadbuilders' portable-section plant, for contractors who desire greater capacity than is afforded in the Dutchmill plant.

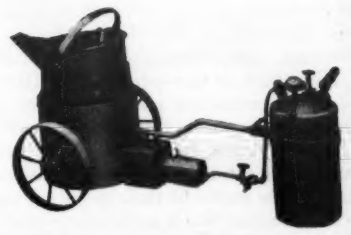
Written concisely, these bulletins summarize the operating features and the uses of each type of plant, together with general specifications. Copies of either or both may be secured direct from the manufacturer by referring to this review.

CONNERY'S HEATING KETTLES

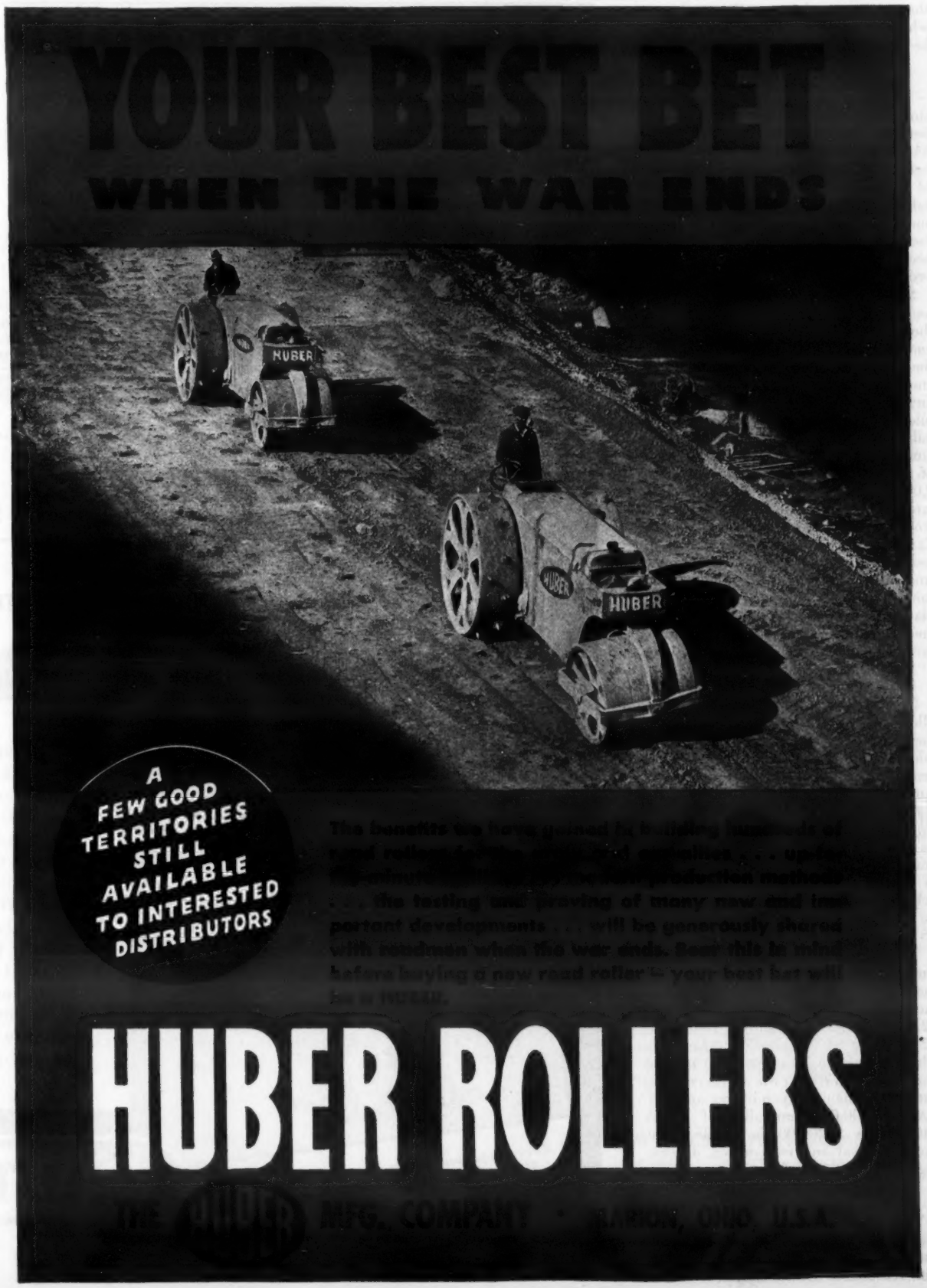


Speed up work by using a Connery Heating Kettle for building and maintaining highways, airports, barracks and roads. Made in sizes of 30, 80, 110 and 165 gallons.

Send today for our complete catalog showing our full line of Tar and Asphalt Heating Kettles, Spraying Attachments, Pouring Pots, etc.



CONNERY CONSTRUCTION CO.
4000 N. Second St. Philadelphia 40, Pa.



How New Mexico Meets Snow and Ice Problems

(*Continued from page 1*)

where high winds complicate the snow problem and the scarcity of telephones does nothing to aid in handling it. Heavy transport trucks frequently jackknife and block the highway so completely that it becomes necessary to remove passengers from their cars and transport them to warmth and food before their cars can be released from the traffic blockade.

Because New Mexico does not have the advantage of consistent wind direction, snow fences are not as effective as in some of the plains states to the north. They must be set to provide for winds from any direction and experience is the only reliable guide to their most advantageous location for a particular section of highway. Lath fences are used, being set 200 to 400 feet back from the roads they protect, either parallel to it or at whatever angle experience has proved to be most effective.

Ice Control

The intermittent recurrence of snow storms with periods of warm weather between, which lightens the snow-removal problem in New Mexico, adds materially to the expense and difficulties of ice control. Icy hills and curves, once safely sanded, refuse to stay sanded, since the warm days and cold nights melt the ice and refreeze the moisture, necessitating repeated applications of protective coatings in the same locations.

Sanding materials are obtained from local pits without screening and, although stockpiles are provided in advance at locations known to be critical, the frost line does not penetrate deeply enough to prevent their replacement at any time from natural deposits. Stockpiles are treated with approximately 10 gallons per cubic yard of unrefined calcium chloride, a liquid containing about 46 per cent solids, which is hauled in 2,000 and 3,000-gallon booster trailer tanks behind Ford and Chevrolet trucks from the American Potash Co. plant at Carlsbad. When sand is being used directly from pits without preliminary stockpiling, the liquid is applied to the sand in the truck body and mixed during placing operations by the two or more men who throw the sand-chloride mixture from a slowly moving truck.

Highway Budget

New Mexico's 5-cent gasoline tax is allotted entirely to the Highway Department, with no diversion of revenue. In addition, the Department receives 45 per cent of the vehicle-registration receipts. An additional 15 per cent of the registration fees goes into the county road funds while the remaining 40 per cent of income from registration fees, being considered actually a property tax as it is the only tax assessment against the vehicle, is allotted to the general funds, 25 per cent going to the counties and 15 per cent to the state.

The gasoline-tax receipts, plus its share of the registration fees, provide the Highway Department with a normal income of about $6,000,000, of which $2,000,000 is required to retire the $20,000,000 of outstanding debentures which bear from 2 to 5 per cent interest and have from five to fifteen years yet to run. Maintenance expenditures approximate $1,500,000 annually, of which $40,000 to $120,000 is required for snow removal and ice control, depending on the severity of the winter.

Post-War Planning

This excess of income over present expenditures permits New Mexico to embark on a post-war planning program with reasonable assurance that it will be able to match whatever Federal funds may be made available for a very worthwhile program of reconstruction and betterment. Because of the large amount of Federally owned land in New Mexico, the state's normal contribution to Federal-Aid highways is only 36 per cent which may be reduced to a smaller per cent by the contemplated program. On that basis it is anticipated that $50,000,000 of work can be completed in the three years succeeding the end of hostilities, and planning is progressing with that objective in mind.

Although the loss of technical men was quite heavy during 1940 and 1941, these men are gradually returning to the Highway Department and five complete survey crews are now engaged in field operations, largely on surveys for new locations required to improve both the Interregional and state highways to revised standards. The entire central drafting-room force of about twenty men is engaged on this work, all of which is done in the central office which also provides supervision for the field surveys, since the district offices handle maintenance and construction only.

New Mexico does not differentiate between monies spent for roads and bridges since they are usually handled under one contract. Multiple-box culverts are favored over long-span bridges

(*Concluded on next page*)

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It will pay you to investigate Hobart "Simplified" Arc Welding for the metal fabrication part of your construction jobs. It's the fastest, most economical method you can find to join metals, and Contractors everywhere find a Hobart Welder the most universal piece of equipment to be had. Write for this FREE Welding Design Service that shows hundreds of ways to benefit from Arc Welding.

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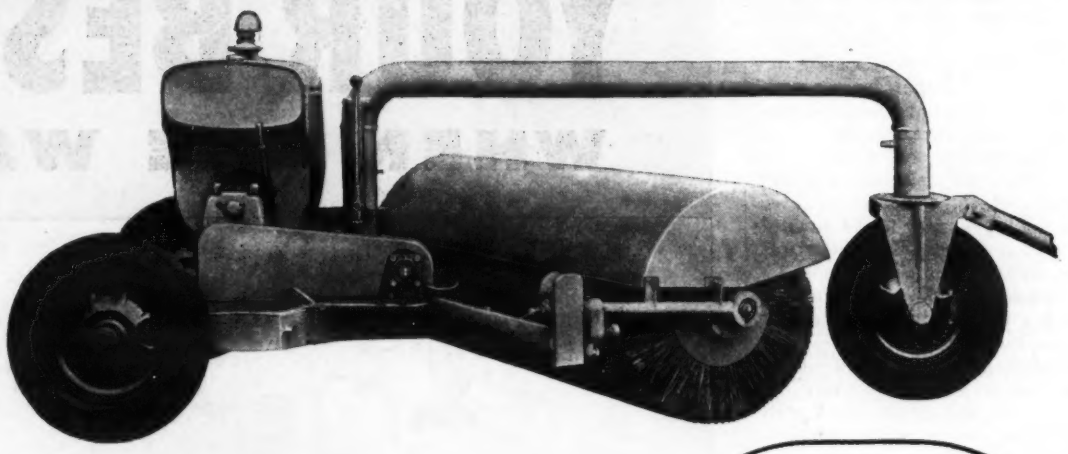
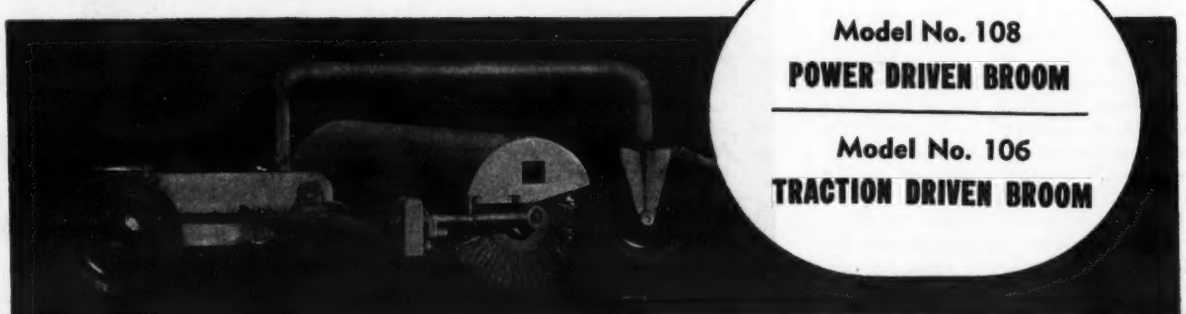
LITTLEFORD ROAD BROOMS





Model No. 108
POWER DRIVEN BROOM

Model No. 106
TRACTION DRIVEN BROOM

Above—Traction Broom sweeping away dust to give perfect bond when Bitumen is applied.

Below—Power Driven Broom sweeping away loose dust before Bitumen is applied.

Before applying asphalt or tar to a road, use a Littleford Road Broom to sweep away the dust and dirt. Littleford Power or Traction Driven Brooms can be changed to sweep right or left—they're two way Brooms — can change from one sweeping position to the other in less than two minutes time. A hydraulic lift adjusts the tension of the Brooms on the sweeping surface. These modern Brooms are designed to do their share in building post-war roads.

LB LITTLEFORD
BLACK TOP ROAD MAINTENANCE EQUIPMENT SINCE 1900

Littleford Bros., Inc.
485 E. Pearl St.,
Cincinnati 2, Ohio

Planning for Post-War Highways in New Mexico

(*Continued from preceding page*)

since the water courses carry little debris to obstruct the smaller openings and the multiple boxes can provide a full-width travel way with little additional cost.

Several million dollars' worth of completed plans are now available and many more will be finished within the next few months as they are now substantially complete. The Department still suffers from a shortage of draftsmen and designers, particularly bridge design specialists.

Right-of-Way

Since the Highway Department has the right of eminent domain and can acquire title and use of needed lands in short order when construction is started, it is considered unnecessary to complete all acquisition of rights-of-way at this time. Partly because land in New Mexico is usually owned in extremely large tracts, there is seldom any difficulty in acquisition, which is accomplished normally by the counties but can be done by the state. Absentee ownership causes the greatest delays but since the work can proceed and damages be assessed later by three appraisers appointed by the district court, even this difficulty need not delay construction.

In a state having a population of only 4.4 persons per square mile and in which stock raising is a principal industry, the construction of considerable mileages of right-of-way fences is a part of the highway construction program which is essential to the safety of the traveling public. This can be done along with the contract for the rest of the work for a cost of approximately $500 per mile. It is the present policy to include such fence construction with all contracts for new location where fences are not in place.

For the same reason of protecting the public from the menace of stock crossing the highways, cattle passes 5 feet wide and 7 feet high are frequently constructed where a smaller opening would serve for essential drainage. A rather surprising sidelight on this practice is the fact that the 5 x 7-foot opening, while ample for the passage of cattle, is inadequate where sheep are to use the stock pass, since they have a tendency to rush the opening and trample each other in the cramped quarters.

While construction of right-of-way fences and stock passes is done solely to insure the safety of the automobilist using the road and is in no sense a right-of-way consideration, the policy has a helpful effect on the property owners and makes them far less contentious in the settlement of claims for land damage.

Personnel

The New Mexico Highway Department is headed by State Highway Engineer F. G. Healy, and Charles M. Johnstone is Maintenance Engineer.

New Saw Attachment For Electric Drills

A new attachment for electric drills to provide a portable power saw and file has recently been announced by the Chicago Precision Equipment Co., 919 No. Michigan Ave., Chicago 11, Ill. Known as the Saw-Chief, this new device is said to saw rapidly into every kind of metal, casting or rod, wood, or other materials, by placing an ordinary hacksaw blade in the holder. It may also be converted into an automatic file simply by inserting a file in the same chuck or holder. The manufacturer also states that, where electric power is not available, the unit can be efficiently propelled by attaching it to a compressed-air line or flexible shaft.

The inner mechanism of the Saw-Chief is of balanced ball-bearing construction, built for heavy-duty cutting and to withstand hard use. A pistol-grip handle is designed to permit the operator to hold and guide the device with ease. The Saw-Chief can be attached to any electric drill with a ¼-inch chuck, and may be obtained with or without the heavy-duty electric drill.

Further information on this new device may be secured by interested contractors and state and county highway engineers direct from the manufacturer by referring to this text.

New Steam-Hoist Bulletin

A new bulletin has been issued by American Hoist & Derrick Co., St. Paul 1, Minn., covering American steam hoisting engines from 7,500-pounds to 11,000-pounds line pull. These hoists, equipped with expanding V-type frictions, are made in the basic single-drum hoist which can be equipped for more complex duty by adding a second and a third drum and a slewing attachment.

Bulletin 100-H-4B, which gives more complete data than earlier bulletins on these hoists, may be secured direct from the manufacturer.

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Power Mowers

ALL OVER THE WORLD

TORO MANUFACTURING CORP'N.

MINNEAPOLIS, MINN.

MOWING MACHINERY SPECIALISTS FOR OVER 20 YEARS

Bethlehem Steel for POST-WAR HIGHWAYS

It's going to be a huge post-war job, building the new highways needed by a growing America, carrying out hundreds of construction projects that had to lie fallow during the wartime years.

When the job begins, Bethlehem's complete line of highway products will again be at the service of road builders. Bethlehem road steels, backed by years of experience, have proved themselves—they're engineered all along the line for sturdy performance.

Plan to handle your post-war highway contracts by specifying this reliable source of supply for *all* road-steel products. Contractors can save time, bookkeeping and letter-writing by placing one order for all their needs for a given highway job with a conveniently-located Bethlehem warehouse. For full information about Bethlehem Road Steel Service, get in touch with the nearest district office, or write direct to Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL

REINFORCING STEEL

Bethlehem *Reinforcing Bars*, plain and deformed, are made of new billet steel in standard sizes and grades, and can be bent to shape and cut to size in most Bethlehem warehouses. *Bar Mats*, made of deformed bars clipped together, are easy and convenient to install, and lie flat. *Welded Wire Fabric* is fabricated from tough, cold-drawn wire to meet all standard highway specifications.

HIGHWAY GUARD

Bethlehem's beam-type guard rail, called the *Safety-Beam*, is made in standard 12 ft., 6 in. lengths, or if preferred, can be supplied in lengths up to 50 ft. *Cable Guard Rail* is durable three-strand steel cable, with a double-galvanized coating. *Highway-Guard Bracket*, made of high-tensile spring steel, is attached with one bolt to steel or wood posts, and supports three or four cables.

STEEL POSTS

Bethlehem *Steel Highway Guard Posts* are readily driven and have superior resistance to impact and side thrust. Bethlehem also makes posts for right-of-way fence, as well as the fence itself.

STEEL PILING

Bethlehem *Steel Sheet Piling* for temporary or permanent retaining structures. *Steel H-Bearing Piles* for bridges, over- and under-pass, and other load-bearing structures.

OTHER BETHLEHEM PRODUCTS FOR HIGHWAYS

ROAD JOINTS · DOWELS · DOWEL BAR SUPPORTS
ROAD STRIP · WIRE ROPE AND STRAND · BAR TIES
GUARD RAILS · ANCHOR RODS · RIGHT-OF-WAY FENCE AND POSTS
PIPE · HOLLOW DRILL STEEL · DIGGING BARS
STRUCTURAL STEEL · STEEL CRIBBING MOLD BOARDS
REINFORCING FOR CONCRETE · BRIDGE FLOOR REINFORCING
CORRUGATED SHEETS · CONCRETE SLAB SPACERS
TURNBUCKLES · TIE RODS, SPIKES, BOLTS AND NUTS
TIMBER BRIDGE HARDWARE

What Is "Breakdown" In Lubricating Oil?

The word "breakdown" as applied to lubrication is probably one of the most commonly used and misused words in the field of lubricating-oil parlance. Lubricating oils do not "break down" in the normally expected service for which they are intended. "Breakdown" implies decomposition, disintegration, and molecular disruption. These are phenomena which occur only when the oil is subjected to conditions of temperature and pressure completely outside the field of "lubricating". Long before the lubricant will "break down" in the true scientific sense, the machine or part being lubricated would have ceased to function.

Unfortunately the word "breakdown" as a synonym for "lubrication failure" has been so widely accepted that any challenge to its usage may have to become a crusade. To correct this misuse of the word "breakdown", education and discussion of those factors which contribute to lubrication failures are needed. For example, there are lubrication failures due to fuel dilution; failures due to increase in temperature; failures due to overload; failures due to speed-up. None involve "breakdown" of the lubricants, though some condition of operation may have contributed to their deterioration. This brings to mind what Webster has to say. According to the Collegiate Dictionary, "breakdown" is "(1) A breaking that causes collapse, such as of machinery or health. (2) Chemical decomposition. (3) A noisy, rapid, shuffling dance."

"Deteriorate" in turn is defined as, "to make or grow worse; to impair; degenerate. Deterioration implies impairment of quality, character or value."

The word "deterioration" aptly describes the state of a lubricating oil which has been impaired in lubricating value.

In Volume XXX, No. 7 of *Lubrication* published by The Texas Co., from which this material is taken, an article continues the detailed discussion of "breakdown" under such headings as Chemical Decomposition, Lubricant Deterioration from Internal Causes, and Externally Caused, and the Responsibility of Management for Proper Lubrication.

Copies of the issue of *Lubrication* referred to may be secured by writing direct to The Texas Co., 135 E. 42nd St., New York 17, N. Y., and mentioning this discussion.

Southwest Equipment Described in Catalog

The line of construction equipment made by the Southwest Welding & Mfg. Co., Alhambra, Calif., is fully illustrated and described in a new loose-leaf binder-type catalog recently issued by that company. Included in the line are Southwest Hi-Speed Earth Movers, bulldozers, brush cutters, rotary and heavy-duty rippers, power units, tractor cranes, rock-type dump bodies, sheepsfoot rollers, pressure sprinkler tanks for truck mounting, and the two-wheel single-cable-controlled Hauling Scoop.

Features of these various units are described, and sizes and specifications of the various models are given. Copies of this catalog may be secured by those interested by writing direct to the manufacturer on their official letterhead and mentioning this review.

Engine
No. 100,000
Already on its way to join the other Detroit Diesel 6-cylinder engines serving in America's landing craft, tanks, trucks, bulldozers and other war equipment.

10 DIVISIONS OF FIGHTING ENGINES

MONTHS ago the Detroit Diesel Engine Division of General Motors sent engine No. 100,000 off the production line to its war job. Many more have followed since. Measured as men, more than ten divisions of these six-cylinder Diesels are actively in the fight. They're in landing craft helping to crack Fortress Europe and to cut the Nips' string of islands. They're in tanks, trucks, bulldozers and all kinds of other equipment. The reasons are, these Diesels are tough and dependable. They're easy to maintain. They burn inexpensive fuel oil.

They have been tried and proved in all sorts of war jobs on every battle front. And they've been found good.

With the coming of peace these engines will be available for all the applications where America will need reliable, low-cost power.

KEEP AMERICA STRONG BUY MORE WAR BONDS

GM GENERAL MOTORS DIESEL POWER

ENGINES . . 15 to 250 H. P. . . DETROIT DIESEL ENGINE DIVISION, Detroit 23, Mich.

ENGINES . . 150 to 2000 H. P. . . CLEVELAND DIESEL ENGINE DIVISION, Cleveland 11, Ohio

LOCOMOTIVES . . . . . ELECTRO-MOTIVE DIVISION, La Grange, Ill.

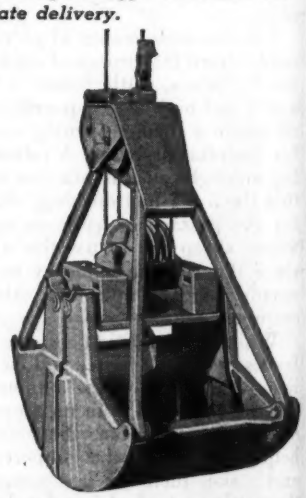
Streamlined for MAXIMUM DIGGING EFFICIENCY

Field tests on a wide variety of jobs have conclusively demonstrated that Johnson All-Welded Buckets dig faster... bring up a bigger payload with every bite.

Power wasting bolts and rivets are eliminated. The shape of the shell provides fast and easy filling with a minimum of lifting action. Lip edge bar of abrasive resisting manganese steel has many times the effective life of the ordinary steel lip. It's easily renewable right in the field, too!

Many other new and exclusive Johnson features in the design and construction of arm bracket, center hinge and sheave blocks step up efficiency . . . reduce time out for maintenance and repairs.

Three types: Rehandling, ½ yd. to 2½ yds.; General Purpose, ½ yd. to 2 yds.; Heavy Digging, ½ yd. to 1½ yds. *General Purpose Type available for immediate delivery.*



The C. S. Johnson Company
Champaign, Illinois

Avoid Waste in the USE OF PAPER!

To Aid the WAR EFFORT—

☆ Every pound of paper must be used wisely.

☆ We must salvage paper normally thrown into the waste basket.

☆ Avoid waste. Salvage paper for military use.

CALL A COLLECTOR!

The new Alemite electric grease gun.

Portable Grease Gun Electrically Operated

A new electric portable power grease gun, Model 7190, is the latest addition to the Alemite line of equipment made by the industrial Alemite Division, Stewart-Warner Corp., 228 No. LaSalle St., Chicago, Ill. The new gun has been developed to deliver fast positive high-pressure lubrication with all types of lubricants that seek their own level.

Equipped with large heavy-duty wheels for easy mobility, operation of the Model 7190 is further facilitated by means of a ball-bearing front caster in the steering mechanism. A quiet driving device connects the heavy-duty ⅓-hp electric motor to a high-pressure grease piston and cylinder, made of specially treated and hardened steel, and fitted to close limits to prevent by-passing. A mercury switch automatically shuts off the motor when 5,000 pounds of pressure has been built up in the delivery hose.

The gun has an easily accessible check valve and pressure release valve. Equipment includes a 12-foot cord, a 6-foot ¼-inch 20,000-pound-burst pressure hose and control valve with hydraulic coupling, combination handle, cord and hose rack. The gun stands 28½ inches high, 15 inches wide, and 26 inches long.

Further information on this new Alemite electric grease gun may be secured by interested contractors and state and county highway engineers direct from the manufacturer. Just mention this item.

A New Tough Pencil In Standard Colors

As a result of an exhaustive study of writing problems in production departments, designing and drafting rooms, and in the field, the Reliance Pencil Corp. has created a new tough Templar colored indelible pencil. The bright water-soluble strong leads in these colored pencils can be used for signatures, checking purposes, drafting, map and chart coloring, production graphs, and art work. The unusual strength of these pencils means fewer or no broken points which cause so many annoying stoppages with most colored pencils.

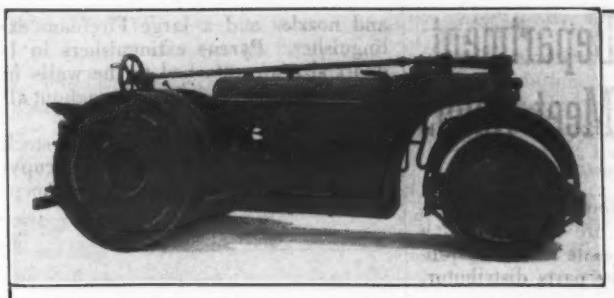
A quick selection of the right color is a simple matter because each Templar colored pencil is finished in bright enamel to match the color of the lead. The wide range of colors can be used for any type of work where color is essential. Samples of this exclusive Reliance pencil may be secured by readers of CONTRACTORS AND ENGINEERS MONTHLY by writing on their own letterheads directly to the manufacturer at 22 South 6th Ave., Mount Vernon, N. Y., requesting a sample Templar colored indelible pencil.

Treatment of Subgrade To Prevent Frost Boils

The Highway Research Board special committee to study the treatment of subgrade soils with calcium chloride to prevent detrimental frost action has announced the formulation of a procedure for practical field tests. It includes detailed information on the methods for treating frost-heaving subgrades under rigid, flexible and gravel-type surfaces and instructions for obtaining the necessary data. Special forms have been prepared for recording the performance of experimental sections.

The Chairman of the Committee is F. C. Lang, Engineer of Tests, Minnesota Highway Department, and the other members include J. E. Lawrence, Maintenance Engineer, Massachusetts Department of Public Works; K. B. Woods, Assistant Director, Joint Highway Research Project, Purdue University; A. G. Cochran, Highway Engineer, Ohio Department of Highways; A. F. Mathews, Engineer of Soils, Michigan State Highway Department; and F. R. Olmstead, Public Roads Administration.

Help our fighting forces to a speedy and complete victory by buying—and keeping—more War Bonds!



What's *different* about this THREE-WHEEL ROLLER ?

The wheels (rolls) are cast *hollow* and are fitted with portholes so they can be filled with water or sand—thus increasing the weight of the roller to produce more ground pressure when needed—a very desirable feature.

Variable Weight—that's the answer!

Other important features are its *ruggedness*, its *easy steering*, its *clear vision*, and *operator-comfort*.

FOUR SIZES: 4-5 ton, 5-8 ton, 8-10 ton, 10-12 ton. WRITE FOR LITERATURE.

Manufactured by

J. E. INGRAM EQUIPMENT CO., 1146 W. Laurel St., San Antonio 6, Texas

ROCK OR DIRT DUMPED *Instantaneously*

MORE TRIPS PER HOUR

Time saved on the fill is time saved for every trip . . . more trips per hour . . . more production per shift. The Koehring Dumptor dumps any type material *instantaneously*. Seconds saved over mechanical dumping method speeds up every hauling and dumping job. Rock or dirt is dumped equally fast and the load is dumped clean every time . . . ready for a full load every trip.

KOEHRING COMPANY

Milwaukee 10, Wisconsin

DEPEND ON YOUR KOEHRING DISTRIBUTOR to help you keep your equipment operating. Care for your Koehring equipment *NOW*, so it will serve you tomorrow. Koehring distributors have genuine Koehring parts. Koehring parts warehouses are at your service.

KOEHRING HEAVY DUTY

ARMY E NAVY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

Equipment Department Grows To Meet Needs

(*Continued from page 17*)

a maintenance division. Stored in bins, shelves, and boxes are items which would stock a wholesale hardware jobber or an automotive parts distributor.

Cleaning Room and Motor Shop

One building houses the cleaning room and motor shop. At the time of our visit the former was being used for cleaning a Bucyrus-Erie shovel, on which three men were busily engaged. A 20-hp horizontal boiler furnishes steam for this operation as well as heat for the entire building, distributed through well spaced unit heaters. Turco or Wyandotte cleaning compound is mixed with starch, swabbed on all equipment, and cleaned off with jetted steam. Turco 92 and 97 are used for tar solvent in a similar manner. A Curtis compressor furnishes air for air cleaning, and a metal tank 3 x 3 x 5 feet in size is used to boil motors with a mixture of cleaning compound and water. The fluid in this tank is heated by coils in the side which are fed by steam from the horizontal boiler.

In the motor shop a Snogo, three trucks, and two passenger cars were receiving attention. An overhead trolley runs the length of the shop, with a Yale & Towne 2-ton chain hoist for lifting. A 40-ton Manley hydraulic press is available, a Canedy-Otto 21-inch drill press, and a Storm piston grinder. A Purox portable welding outfit with racks, torches, and mixing valves was in use, as was a Van Norman valve facer.

In the electrical side of the shop, a Hobart motor test bench is installed, flanked by a Weidenhoff testing machine, a Champion spark-plug tester, and a cabinet containing electric tachometers, voltmeters, and compression testers. A Breeze brake-lining machine stands near the electrical section, and in a cabinet in the northwest corner are stored miscellaneous special tools with a special compartment for the Van Norman boring bars, two models of which are available, No. 999 and No. 777.

On a rolling metal bench, 4 x 6 feet in size, with storage cabinets underneath, are mounted a Sunnen piston-pin-hole grinder, a Lee reamer drive and a Kwik-Way valve-facing machine.

Heavy Machine Shop

Entering the largest building from the east, the first department is the office in which the Equipment Engineer, the Shop Superintendent and six clerks transact the clerical operations of this repair center. The offices occupy about 20 feet at the east end of the building and immediately behind them is the service room where washing, greasing and tire repairing are performed. In addition to a hydraulic grease rack, this room houses a tire inspection machine and two tanks for testing inner tubes as well as a shop-built fire truck, not powered, carrying 250 feet of 4-inch hose with connections and nozzles and a large Firefoam extinguisher. Pyrene extinguishers in 1-quart size are attached to the walls in easily accessible locations throughout all of the shop buildings.

Behind the service room is a stock room and shop foreman's office occupying about 28 feet of the east-west dimension for the width of the building, in which is stored tool steel, welding rods, and other durable items used in the shops.

The west 100 feet of the building is entirely taken up by the heavy machine shop and the equipment being repaired. On the day of our visit, a Cedarapids screening and crushing plant which had barely been squeezed through the 12 x 12-foot hand-operated overhead door in the west end of the building and a completely dismantled Bucyrus-Erie 1035 shovel occupied most of the available space. Doors of the same size and type

(*Concluded on next page*)

This might have been your NEW shovel, but . . . .

Your present equipment, working 'round-the-clock will last longer and continue to perform efficiently if these common-sense rules are followed:

- insure proper regular lubrication.
- provide daily inspection to detect troubles while they are still small
- make adjustments when needed—don't wait
- tighten loose bolts and nuts
- keep fuel, lubricants and water clean
- remove clutch and brake bands and clean lining with good grade of clear gasoline
- change cables end-for-end to increase life of wire rope
- plan work to favor machine
- inspect engine regularly — flush radiator when dirty
- always give model and serial number when ordering repairs
- contact your BAY CITY distributor for parts and service.

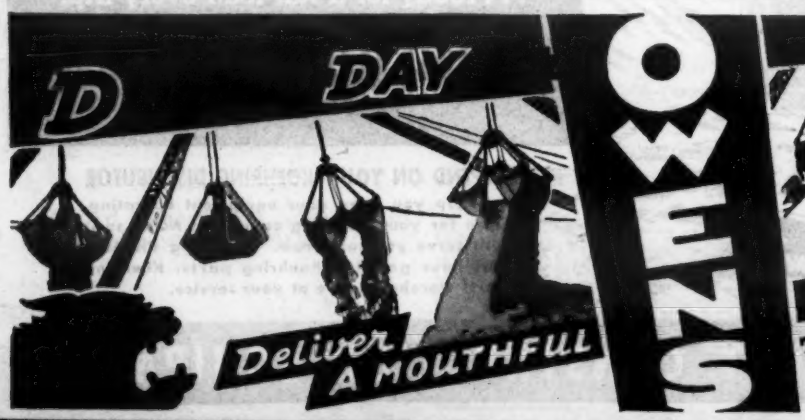
here again BAY CITY helps build airfields in the Solomon Islands

Throughout the Pacific theaters of operations the Seabees are making historic records in fighting and construction. Your new equipment—like this BAY CITY which is excavating coral deposit for an advanced airfield—has gone to war. And because there will be no new shovels or cranes released for civilian requirements until after the war is won, it is important that present equipment be kept in good operating condition. Observe the few simple, common-sense rules of maintenance. They will lengthen the life of your machine and help you keep going until new BAY CITY crawler or pneumatic tire mounted shovels, cranes or draglines are again available. In the meanwhile, we will be glad to send you catalogs and specifications so you will learn why BAY CITY offers such low-cost, dependable operation. Write Bay City Shovels, Inc., Bay City, Michigan.

BAY CITY SHOVELS

BAY CITY

SHOVELS • CRANES • DRAGLINES • TRENCH-HOES • SKIMMERS



Central Shops Serve Montana's Equipment

(*Continued from preceding page*)

are installed in both the north and south walls of the shop. Overhead tracks run the full length of the shop on which one 5-ton and two 2-ton Yale & Towne chain hoists handle heavy parts, traveling on shop-built rollers.

Stationary machines are ranged in two roughly parallel lines along the south wall of the shop, except for a shop-built forge with a Buffalo blower in the northwest corner and the Lincoln fan ventilator installed to discharge through a window in the northeast corner. This ventilator has long flexible metal tubes which are used to draw off the gases generated when a welder is working in cramped space under or in a piece of heavy equipment. A portable 2-ton Weaver hand-operated hoist and a G-E arc welder driven by a Ford V-8 motor are moved about as needed. A 40-gallon Firefoam wheel-type extinguisher provides fire protection.

The stationary machines are group-driven by a 22-hp General Electric motor which would be inadequate if all machines were operated simultaneously but furnishes ample power for any combination of tools which are apt to be running at the same time.

Starting from the east end are grouped in order a South Bend engine lathe with 8-foot bed and 16-inch swing; a Weaver 30-ton hydraulic press wide enough to take a 36-inch piece and with 40 inches of vertical capacity; a Sibley drill press to handle up to a No. 4 spindle, with a 36-inch vertical raise and designed to drill 24 inches from a free edge; a 9-inch Peerless power hack saw; a No. 3 Kemp Smith milling machine with divider head for cutting gears, sprockets, or splines; an old Fulton lathe with 8-foot bed and 16-inch swing; a No. 2 Milwaukee shaper; a stand-mounted grinder with two 2 x 12-inch wheels; and an American lathe with a 16-foot bed and a 27-inch swing. An Ingersoll-Rand Type 30 compressor set against the wall and driven by an electric motor furnishes air for the entire heavy-machine-shop operation. A small Fraser grinder and a Pittsburgh grinder with a 5-foot table and 12-inch swing are placed near a Firestone 150-ton hydraulic press in the west end of the room. An Oxweld MP-101 25-pound acetylene generator with rack for oxygen tank and Oxweld torches and mixing valves is moved about as needed.

The entire building is equipped with unit heaters, steam for which is generated in a Case horizontal 20-hp boiler set in a built-on addition to the main building. A shop-built coal-handling elevator lifts coal brought in by truck onto the roof of this addition from where it drops into bunkers level with the boiler-room floor and is hand-fed into the boiler.

Almost all repairs to heavy department-owned equipment are made in this Central Shop, although in some cases local commercial machine shops are called on for help, this being a two-way proposition in which the state shop lends special tools as often as it borrows them. In addition to handling the repairs, the shop has designed and built all heavy trailers used by the state for moving large equipment, including one 40-ton capacity trailer with a special steering gear which has given excellent service for the past five years. This trailer is supported on two axles each mounted on eight 9:00 x 15 tires set in line both fore and aft.

Personnel

The Montana Highway Commission's Central Repair Shops are operated under the direction of R. A. Stephenson, Equipment Engineer, assisted by W. B. Kiefner, Shop Superintendent. Al Stewart is the General Foreman of the Central Shops in Helena.

Lloyd R. Wilson Resigns

Announcement has been received of the resignation of Lloyd R. Wilson as Vice President and Director of the Ransome Machinery Co., Dunellen, N.J., a subsidiary of the Worthington Pump & Machinery Corp., Harrison, N.J. Mr. Wilson's resignation terminates his connection with this company.

Climax

provides

FAST, AGILE HORSEPOWER

for this 35-42 ton Industrial Brownhoist Locomotive Crane

This 35-42 Ton Industrial Brownhoist Locomotive Crane, built for the U. S. Army is equipped with a Climax R6I—166 hp., six cylinder engine.

● The quick accelerating abilities, high lugging capacity and enduring stamina of Climax Engines are qualities known to every user in the construction industry. Over 30 years of extensive research, field experience and technical refinement are incorporated into these modern heavy duty prime movers.

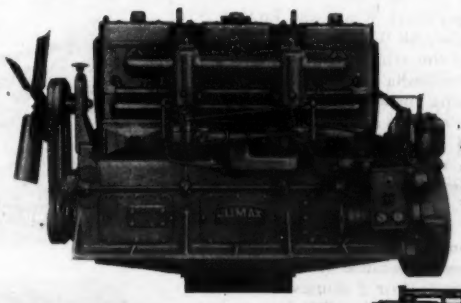
Climax Engines deliver maximum power on gasoline or butane. The valve-in-head design provides high efficiency, fuel economy and utmost accessibility. Smooth, quiet running, and freedom from destructive vibration result from the reinforced engine construction and balanced design. The crankcase is a rigid one piece casting, ribbed for extra strength, and the crankshaft is a precision-balanced heat-treated steel forging fitted with babbitt lined, bronze-backed bearings.

The Climax Blue Streak Combustion Chamber gives a faster pick-up and get-away at all speeds within the operating range. The particular shape of this patented combustion chamber, and the precise location of valves, improve gas mixing and cylinder scavenging. Thus, the tendency to detonate when sudden overloads are encountered is greatly reduced.

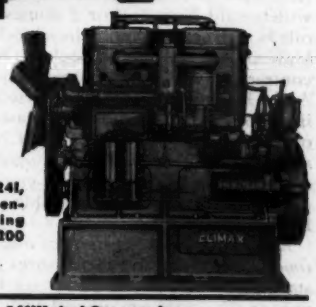
The wide speed range with close regulation, the ample cooling areas and highly efficient lubrication system of these engines give them a long effective life with minimum maintenance.

CLIMAX ENGINES are made in sizes up to 495 hp., in four, six, eight and twelve cylinder models. They may be specified for mobile or stationary service in outdoor or indoor locations.

WRITE TODAY for full information to Climax Engineering Company, 1811 South Fourth Street, Clinton, Iowa.



The Climax R6I, six cylinder engine, developing 166 hp. at 1200 r.p.m.



The Climax R4I, four cylinder engine, developing 120 hp. at 1200 r.p.m.

"For High Achievement in the Production of War Material"

Climax Engineering Company

GENERAL OFFICES AND FACTORY: CLINTON, IOWA

REGIONAL OFFICES: CHICAGO, ILLINOIS • DALLAS, TEXAS

Affiliated Companies:

McAlear Mfg. Co., Chicago • Hanlon-Waters Co., Tulsa

The Rud-o-Matic Tagline is operated on a spring principle and maintains at all times a positive tension sufficient to steady a clam shell bucket under any and all conditions, and will operate perfectly with the boom at any angle. It eliminates all the grief usually encountered with the average tagline as there are no weights, tracks, pins, carriages, or sheaves to wear out or to get out of order. Because of the large bearings and fewer sheaves, the saving on cable alone would eventually pay for it.

Tagline is complete with fair lead and cable attached and can be installed in less than one-half hour. Most of the crane manufacturers have adopted the Rud-o-Matic as standard equipment.

McCaffrey-Ruddock Tagline Corp.

2121 E. 25th St., Los Angeles 11

FOR SALE

Three (3) Allis Chalmers

TRACTORS

Model "LL"—High Compression. Rebuilt in our own shop and guaranteed. Bargain for quick sale.

Address:

E. J. Albrecht Company

2626 West 26th Street, Chicago 8, Illinois

Standardized Design Speeds Bridge Work

(*Continued from page* 11)

the bridge sites by railroad, steamship, narrow-gage railroad, and truck, many handlings were necessary, with storage at docks, railroad yards, and bridge sites. An effort was made to keep shipping pieces under 40 feet in length, but it was necessary to allow a maximum length of 55 feet on some of the special bridges. Study of the transportation problem indicated the desirability of following the usual export practice of shipping with all large gusset plates loose. All small pieces were boxed or fastened to a larger piece for shipment.

Identification of pieces was important. A different color shop paint was used for each of the three geographical divisions of the highway, and a colored symbol was adopted for each bridge.

Public Roads Administration Photo

The Big Gerstle River Bridge, one of the standardized structures on the Alaska Highway, consists of nine 200-foot through trusses.

The symbols were painted on the four sides of each piece and box, and the bridge name was painted on the top chords and floor beams.

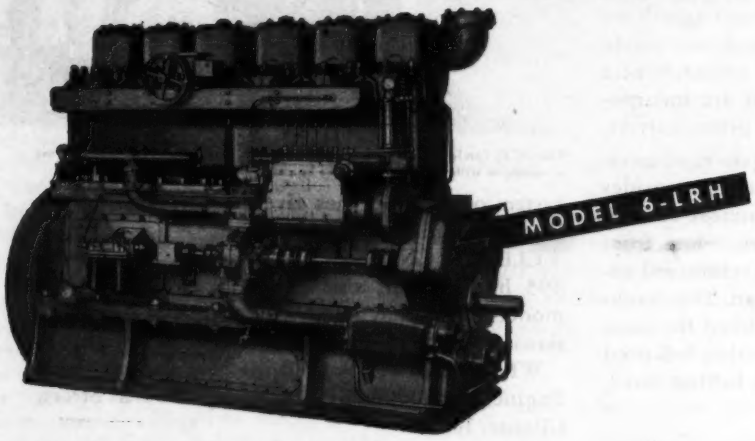
Standardized Design

It was possible to classify nearly all the bridges on the Alaska highway early in 1942 before detailed information was available. While the exact overall length of any crossing could not be determined with any certainty at the time, a fairly accurate estimate of requirements was obtained. On the basis of this information, it was decided to make standard designs of 40, 50, and 60-foot beam spans, 100-foot pony spans, 160, 200, 225, and 250-foot through-truss spans and 200-foot deck-truss spans. Preparation of detailed plans for both special structures and standard crossings, and the variations from standard such as skewed bridges, had to await information from detailed surveys in the field. Aside from the six special bridges, there was a total of 122 spans for structures that ranged in size from a single 50-foot beam span to as many as nine 200-foot through spans.

In the design of the standard spans, several conditions were imposed in addition to those of the standard specifications. Simplification of shop and field requirements was essential. It was required that the standard spans be so designed that any arrangement of spans could be assembled for a single crossing without complications. Accordingly, the end details were standardized. Constant dimensions were established for

(*Continued on next page*)

WAUKESHA
HESSELMAN *Oil* ENGINES



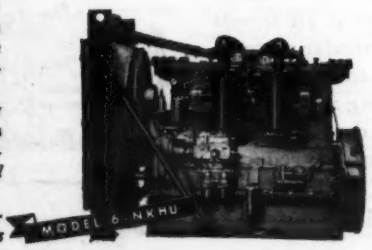
● In wartime every Waukesha Engine is a war-work engine. All Waukesha production is for the use of the armed forces. Until the war is won, Waukesha postwar engine designs are not being shown.

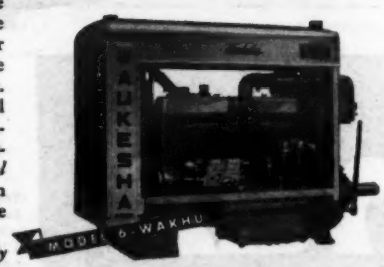
But peacetime models are on the way. New advantages and greater user conveniences will make the new peacetime Waukesha-Hesselman *the world's most wanted diesel-oil engine.*

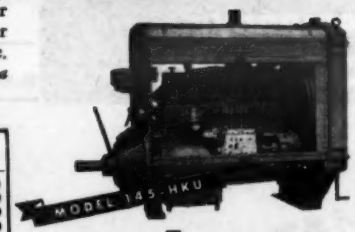
After the war the fuel problem for engine-driven equipment will be serious *unless it is Hesselman powered.* Because it burns those widely sold Nos. 1, 2 or 3 domestic furnace oils as well as high-speed diesel fuels...either high or low cetane...Hesselman will be the contractor's first choice for country-wide use. And a Hesselman may be converted from fuel injection to carbureted gas or gasoline without changing a single major part. *No compression ignition Diesel can be converted from fuel oil to gas or gasoline so quickly, or easily.* Even gasoline injection is possible with the Hesselman.

And Hesselman's *electric and positively timed ignition* and lower pressures give easier starting, less shock load, longer life, lower upkeep than with any other diesel-oil engine.

For your future engine needs, consult Waukesha now. Get Bulletin 1079.







Engine Model	No. of Cyls.	Bore and Stroke, In.	Displ. Cu. In.	Speed RPM
*120-HS	4	3¾ x 5	221	1000-1800
*120-HL	4	4 x 5	251	1000-1800
*VRZH	4	4½ x 5½	353	1000-1600
*140-HS	6	4½ x 5½	468	1000-2250
*140-HK	6	4½ x 5½	525	1000-2250
*145-HK	6	5½ x 6	779	1000-2000
6-WAKH	6	6¼ x 6½	1197	800-1600
6-NKH	6	7 x 8½	1962	600-1050
6-LRH	6	8½ x 8½	2894	600-1050

*These Hesselman Engines are true *multi-fuel engines*, and can be converted to burn natural gas or gasoline, with no internal changes. The others can also be converted to carburetor engines with a minimum of effort.

WAUKESHA MOTOR COMPANY
WAUKESHA, WISCONSIN
NEW YORK • TULSA • LOS ANGELES

do the shovels you're using . . .
WEAR-BACK HERE ?
BREAK HERE ?
TUBULAR SHANK
THIS SHOVEL HAS A BACKBONE
17 GAUGE
13 GAUGE
17 GAUGE
(SOCKET)
(FROG)
All Formed of Thicker Steel
(CUTTING EDGE)
RAZOR-BACK Shovels
are 60% thicker at these points of wear and strain — taper to the sides. Give you 13 gauge strength and stiffness, only 15 gauge average weight.
THE UNION FORK & HOE CO.
661 Hocking Street Columbus 15, Ohio
ALSO STONE, BALLAST, INDUSTRIAL FORKS, ASPHALT AND ROAD RAKES — DISTRIBUTORS EVERYWHERE

But before you tackle the big Post-War concrete contracting jobs, get acquainted with the wide scope in concrete surfacing operations offered by the JACKSON SC-4A vibratory hand screed. Its advantages include lightweight, uniform vibration and adaptability to reasonable widths of section. Gives complete puddling to low-water content concrete. Write for further details.

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN

Basic Bridge Plans For Alaska Highway

(Continued from preceding page)

all through-truss spans from the crown of the roadway to the top of the pier or abutment, center to center of bearings at the piers, and center of bearing to the face of backwall at the abutments. Expansion joints were made alike insofar as the supporting steel was concerned. Both ends of all spans were identical. This procedure made it possible to use the same abutment-seat and backwall construction for all truss bridges and all pier tops could be made alike. A span could be used alone or in conjunction with spans of other lengths without changes in detail.

Tapes used in the different shops were standardized at different temperatures. Each shop was permitted to fabricate all parts of a span without temperature correction. However, actual span lengths at 30 degrees F. were calculated and used in making pier and abutment layouts for specific bridges.

All standard spans were designed and detailed as level structures with normal outline under full dead load. Where it was necessary to place a structure on a grade, appropriate correction was made in the spacing of piers and abutments.

The same floor arrangement was used for all truss spans. Six lines of framed stringers conforming with a 1½-inch crown support a 6-inch roadway slab, the bottom of the slab being flush with the underside of the stringer flange. Curbs were cantilevered outside of the stringers. If it became necessary to lay a temporary wood floor on account of freezing weather, it was made of 2 x 8-inch laminated construction without crown. Different thicknesses of nailing strips were used on the stringers. Wood floors were surfaced with 2-inch running plank. Wood curbs and walks were made similar in form to those of concrete. With timber flooring, expansion-joint openings were spanned with flat plates, but permanent standard expansion dams were placed whenever a concrete deck was installed.

Beam spans consist of five lines of beams placed level, with a roadway slab varying in thickness from 6¾ to 8¼ inches to obtain the crown. Where wood flooring was used, it was similar to that on the truss spans, with all the nailing strips of the same thickness.

The main beams of the 40 and 50-foot spans were not spliced. Those for the 60-foot spans were shipped in two pieces with a field splice near a quarter point. Rocker shoes were used on the 50 and 60-foot spans and sliding bearings were used on the 40-foot spans. Adequate diaphragms connect the main beams.

All the standard spans were designed as Warren trusses with curved top chord since this type presents a good appearance and is economical of material. The panel arrangement was: six for the 100-foot, eight for the 160-foot, and ten for the 200, 225, and 250-foot spans. With this arrangement, most of the members were 40 feet or less in length. A few were as long as 50 feet. Verticals were

Public Roads Administration Photo

A close-up of a 200-foot through truss on the Big Gerstle River Bridge.

used at all panel points to obtain rigidity and provide intermediate supports for the compression chords. Such intermediate supports were particularly desirable should the chords be distorted during shipment. Horizontal ties midway between the top and bottom chords shortened the unsupported length of the web members and made a rigid as well as an economical structure. Wide-flange sections were used for all truss members, except the end posts and top chords which are box sections built up of two channels and two plates. The bottom plates had openings of 8 x 14 inches to give access for riveting and painting. Top lateral struts of chord depth were provided at each panel point. Sway frames, extending to the clearance line, were located at alternate panel points. The lateral bracing was composed of single angles. The shoes were made by welding structural steel. Rockers were placed at the expansion ends. In designing and detailing, a good deal of effort was expended to obtain simple, substantial structures of good appearance with a minimum of strategic material.

Speeding Shop Work

There was no time to be lost in making designs, advertising and letting contracts, detailing, getting material from the rolling mills, fabricating, and shipping by rail, steamship, and truck to the bridge sites. Perfect coordination was mandatory in order to meet the schedule required in 1943.

To avoid confusion and delay, steps were taken to prepare material lists

(*Continued on page* 82)

COMPLETE
WELL POINT SYSTEMS
WILL DRY UP ANY EXCAVATION
Faster—More Economically
Write for Job Estimate and Literature
COMPLETE
MACHINERY & EQUIPMENT CO., Inc.
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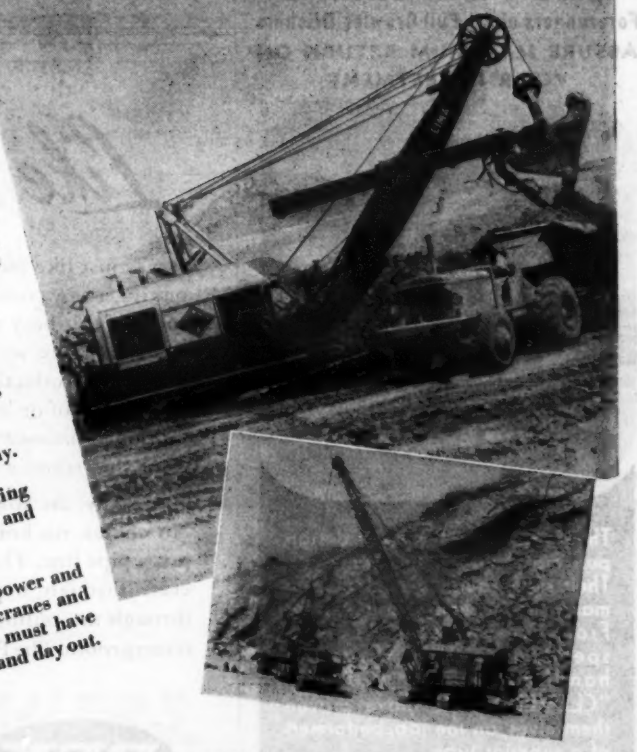
MARKS of LEADERSHIP

The name LIMA on a shovel, crane or dragline is recognized as a mark of *leadership* by users who keep abreast with the latest in power excavator design and performance. LIMA has always been a *leader* in the designing and perfecting of new and practical features to help increase production and to lower operating cost on earth moving projects. This continuous search for new and better methods of doing things has been responsible for many outstanding advancements in excavator design. When you buy your next shovel, crane or dragline be sure it is a LIMA and get these modern distinctive features:

1. Anti-friction bearings at every vital bearing point for greater power and efficiency.
2. Independent clutches—hoist, swing, travel, boom up or down simultaneously.
3. Big wide drums for maximum cable economy.
4. All shafts on which are mounted sliding members are splined for accuracy in fit and elimination of backlash.

These advantages plus the extra power and ruggedness of LIMA shovels, cranes and draglines are qualities you must have for greater output day in and day out.



Keep Buying WAR BONDS

LIMA LOCOMOTIVE WORKS, INCORPORATED
Shovel and Crane Division
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DALLAS, TEXAS SEATTLE, WASH. SAN FRANCISCO, CALIF. LOS ANGELES, CALIF. SPOKANE, WASH.
MINNEAPOLIS, MINN. MONTREAL, QUEBEC, CANADA VANCOUVER, B. C.

SHOVELS, ¼ YD. TO 3½ YD. CRANES, 13 TONS TO 65 TONS
DRAGLINES, VARIABLE

A Marvel Jiffy spray bar mounted on an asphalt kettle.

Spray Bars Now Made For Asphalt Kettles

Now that tar kettles and other oil-burning equipment are hard to get because of priority and rubber restrictions, many equipment distributors are turning to the sale of accessories. The new Marvel Jiffy spray-bar attachment, made by Marvel Equipment Manufacturers, Inc., 224 S. Michigan Ave., Chicago 4, Ill., is designed to fit any standard make of kettle. Any contractor or highway department unable to secure new equipment can attach this spray bar and convert kettles to junior road oilers, airport runway sprayers, or weed-eradicator outfits.

This spray-bar attachment can be assembled and mounted within 30 minutes, either as a permanent fixture or to be removed after each job, according to the manufacturer. Complete information on the Jiffy spray-bar attachment, as well as asphalt and tar kettles in sizes from 30 to 500 gallons, may be secured direct from the manufacturer by mentioning this item.

New Caterpillar Dealer In Mississippi Territory

A new distributor for Caterpillar products has taken over the Mississippi territory, according to a recent announcement by the Caterpillar Tractor Co., Peoria, Ill. The new company, the Stribling Bros. Machinery Co., will replace the Mississippi Tractor & Equipment Co., Inc., from whom it has purchased land, buildings and fixtures located at Jackson, Miss.

R. W. and E. B. Stribling have been in the heavy machinery business for a number of years, R. W. Stribling having operated his own firm, the Stribling Motor Co., at Hattiesburg, Miss., from 1930 to the present. E. B. Stribling was associated with the Caterpillar distributor in Louisiana for eight years, and in 1942 he and his brother organized the Stribling Equipment Co. which he operated.

Servicemen and other personnel of the former distributor at Jackson will be employed by the Stribling Bros. Machinery Co., thus continuing to give Caterpillar owners in this territory the advantage of skilled and experienced mechanics.

Road Builders Ready To Double Best Year

The highway industry and profession can easily handle twice as much highway and street construction as it did in 1930 which was its record year, according to Carl W. Brown, President, American Road Builders' Association, and Chief Engineer of the Missouri State Highway Department. "It would be ridiculous to plan a large highway program for the post-war period if the industry and engineers could not handle it. However, the Alaska Highway, the tremendous airport construction program, the military access roads rushed to completion for the war effort stand as testimonials to the ability of the highway industry and profession to take care of almost any peacetime task asked of it," declared Mr. Brown in a recent interview.

"Construction equipment will be available. To carry on the war, the Army and Navy have required great numbers of the same machines used in construction, with production running from two to ten times previous peacetime needs. There will be surpluses. So, unless there is large-scale construction, equipment makers will have less business than before the war, and thousands of men will be thrown out of work.

"No highway program should be carried on without using the facilities of private enterprise to the utmost. All construction should be awarded on a bidding basis to contractors so that ex-service men and war workers may have opportunity and just rewards for their labors. Here again, in highway contracting we find a huge plant all set to go to work. A survey made by the American Road Builders' Association has determined that highway contractors can construct up to $3,000,000,000 in highways and streets within a year. That is twice the high record set back in 1930, when from there on construction failed to keep up with needs.

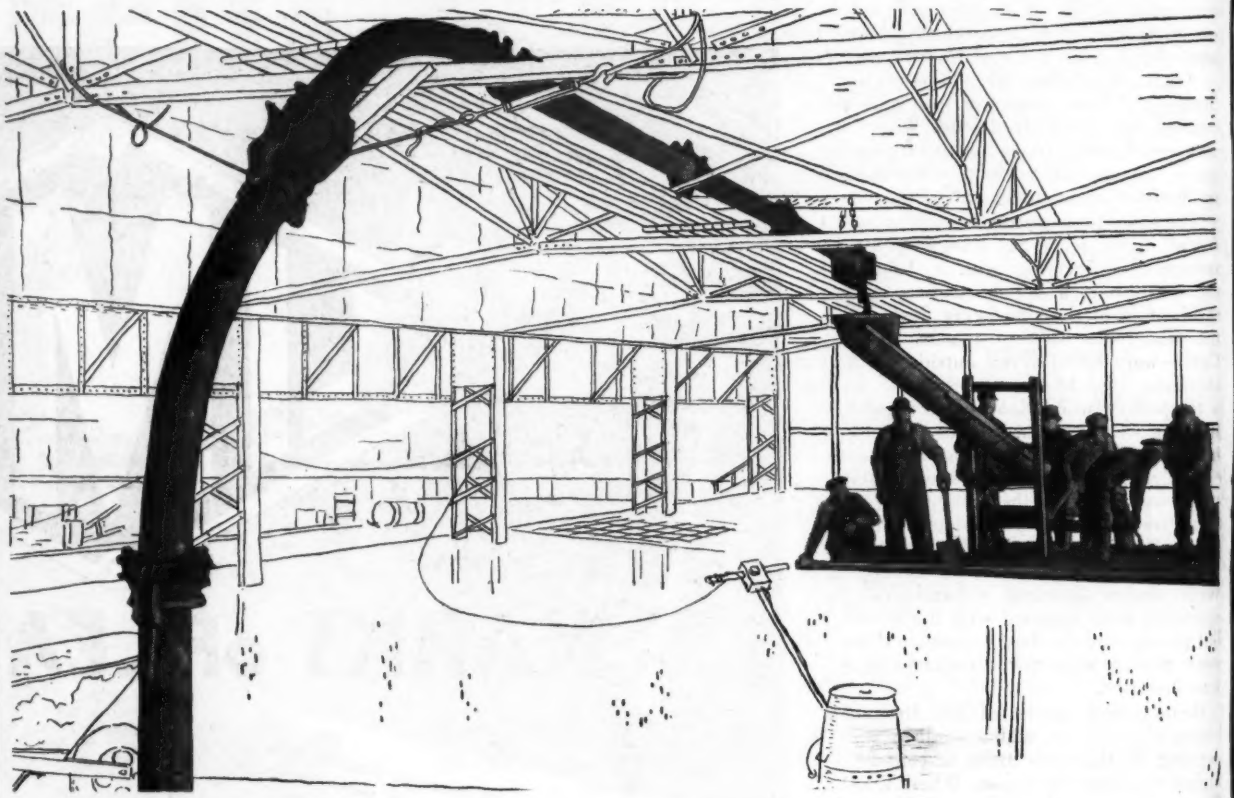
"Accumulating highway needs, because of inadequate programs before and during the war, have reached the astounding total of $16,000,000,000. The streets and roads are not ready for the vast traffic expected after the war. Post-war planning, to be successful, must include highway construction of new and larger dimensions. Construction of adequate roads is basic to the success of practically all plans being made by business and industry," Mr. Brown concluded.

"CLEVELANDS"
Forerunners of All Full Crawler Ditchers
ASSURE MAXIMUM RETURN ON YOUR INVESTMENT

Their modern, job proven design puts more dirt off the conveyor. Their super-quality construction makes them keep doing that from every angle — power, speed, durability — ease of handling and portability — "CLEVELANDS" have proven themselves, on the job performers of a superior type.

PRODUCTS — Ditchers, Wheel and Ladder Type (in several models) — Side Boom Backfillers, Pipe Cranes, etc.

THE CLEVELAND TRENCHER COMPANY
"Pioneers of the Small Trenches"
[illegible] CLAIR AVENUE [illegible] CLEVELAND



Like Putting the YOLK IN AN EGG...

It was just like putting the yolk in an egg, this job of putting a new concrete floor in the second floor testing room of this busy war plant. It had to be done without disturbing the workers in the rest of the plant and impeding production. Concrete could not be run down from the roof or hauled up from the ground in an old-fashioned manner without interfering with somebody —for this room was truly in the middle of the plant.

Actually, the solution was easy . . . Rex Pumpcrete. No chutes, no hoists, no towers, no buggy runs . . . just a pipe line. The pipe line was run from the Pumpcrete through one of the first floor windows, up through the ceiling and along the second floor to the testing room. The Pumpcrete pumped concrete through the pipe line in a fraction of the time it would have taken with old-fashioned methods.

To simplify your difficult concrete placing jobs . . . to speed up placing time . . . check Rex Pumpcrete. It pumps concrete vertically as high as 120 feet or horizontally as far as 1200 feet.

For complete information on Rex Pumpcretes, send for descriptive bulletins. And check the other Rex construction equipment: Moto-Mixers, to speed the mixing, hauling and placing of concrete . . . Pumps, that move water economically and efficiently . . . Mixers, that cut concrete mixing costs . . . Pavers, that can give you really heavy yardage production, faster. See your Rex Distributor or write direct to Chain Belt Company, 1664 West Bruce Street, Milwaukee 4, Wisconsin.

CHAIN BELT COMPANY of Milwaukee

REX
CONSTRUCTION MACHINERY

PUMPS PAVERS PUMPCRETES MOTO-MIXERS MIXERS

1944 Maintenance On Virginia Roads

Shortages Necessitated Careful Selection of the Work To Be Done; Some Resurfacing by Contract

By L. E. AKERS, Assistant Maintenance Engineer, Virginia Department of Highways

✦ IN planning the 1944 program for the maintenance of Virginia's 47,000 miles of primary and secondary highways, the most acute problems which arose were: shortage of man-power, both trained personnel and ordinary labor; scarcity of materials, equipment and equipment parts, as well as the difficulties in securing priorities on such as are available; and the selection of that road mileage on which major maintenance and restoration could and should be done, and the choice of the most economical and practicable type of work for each section of this selected mileage.

The Shortage Problem

Since 1940 there has been a decrease in labor available and used on highway maintenance and construction in Virginia from 27,000 men to less than 6,000. Such a large decrease in man-power means, of course, that any construction except that absolutely necessary to the war effort must be postponed and all available labor used for vital maintenance operations. Thirty road camps, for the approximately 1,800 prisoners from the State Penitentiary who are used for road work, have been established at strategic points throughout the state to make this labor available for regular and emergency maintenance operations.

Much equipment normally used on construction has been transferred to maintenance, to help offset the equipment shortage. Further to alleviate the shortage of both man-power and equipment, such heavy maintenance and restoration work as seemed adaptable are being done by contract.

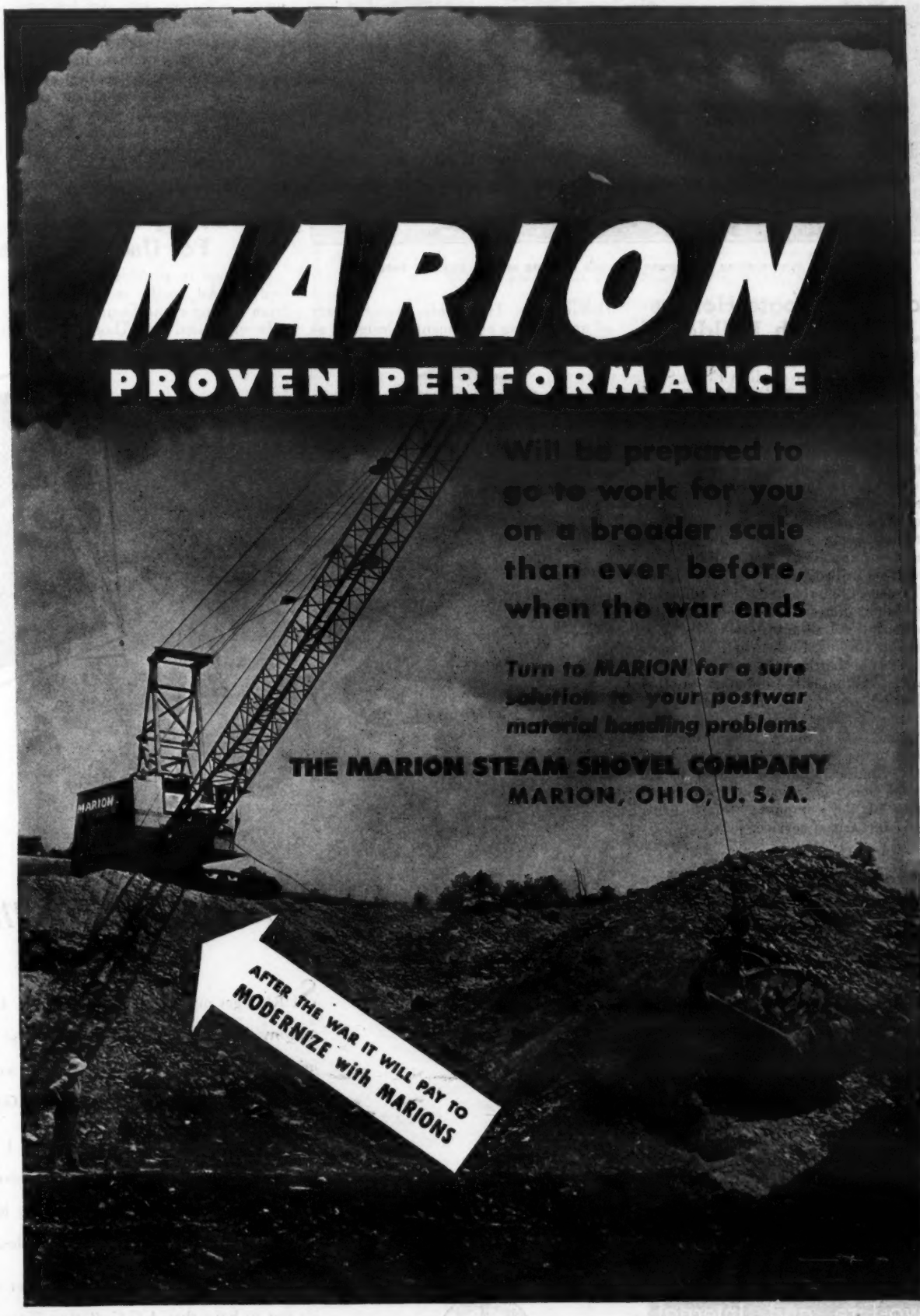
Resurfacing

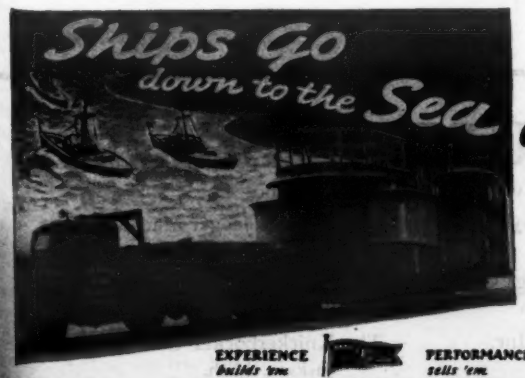
The retreatment or resurfacing of much of Virginia's 14,000 miles of bituminous black-top surfaced roads has, due to the restrictions on bituminous materials, priorities, etc., been deferred for the past two years. Consequently as large a mileage as practicable of the most important of these highways was selected for either light retreatments or resurfacing with bituminous concrete during 1944. Approximately 14,000,000 gallons of bituminous oils will be applied in the light surface treatment work, of which about 8,000,000 gallons will be applied by contract and 6,000,000 gallons by state forces and equipment.

For the more heavily traveled roads which cannot be restored by light surface treatments, contracts were awarded for the furnishing and application of 576,000 tons of bituminous concrete of various types, including twenty-four schedules averaging 24,000 tons each. This work was begun early in May.

The program provides for the retreatment with bituminous oils of about 4,000 miles of highway and the resurfacing with bituminous plant-mixed materials of about 500 miles. While this program is considerably below normal, it constitutes the outstanding maintenance work for the Virginia Department of Highways in 1944. There is also the ever-present ordinary maintenance operations, the conditioning of equipment, and the stocking of materials in preparation for next winter's maintenance.

The estimated cost of this maintenance work for 1944 on the 47,000 miles of highways in Virginia is approximately $15,000,000.


MARION
PROVEN PERFORMANCE
Will be prepared to go to work for you on a broader scale than ever before, when the war ends
Turn to MARION for a sure solution to your postwar material handling problems
THE MARION STEAM SHOVEL COMPANY
MARION, OHIO, U. S. A.
AFTER THE WAR IT WILL PAY TO MODERNIZE with MARIONS



AMERICA'S shipbuilding industry will launch more ships in 1944 than all the rest of the world combined.

ROGERS TRAILERS are a vital link in the mass-production method of ship construction for they are transporting heavy machinery . . . boilers, bulkheads, engines . . speeding Victory ships down to the sea!

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ROGERS TRAILERS are serving efficiently on the home-front too and new models which will be available when war contracts are completed, will be even more efficient than the multitude which have been so successfully operated by industry for many years.

ROGERS BROS. CORPORATION
ALBION,
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★ Buy War Bonds

★ Save Waste Paper

★ Turn in Scrap Metal

★ Be a Blood Donor

★ Pay Only Ceiling Prices

Official U. S. Navy Photo

American construction equipment aids our fighting men to lick the Japs.

LaPlant-Choate Honors Hero with Bulldozers

The accompanying photograph shows Lt. Charles E. Turnbull, CEC, USNR, and Aurellio Tassone, MM 1/c, Navy Seabee, standing by the blade of a LaPlant-Choate Model R-8 bulldozer mounted on a Caterpillar tractor. Tassone, the operator of the outfit, supported by Lt. Turnbull with a carbine, used his tractor-bulldozer outfit to uproot a Jap pillbox, burying twelve Japs and destroying a 37-mm gun and two machine guns. For this action, he received the Silver Star.

Tassone is now touring war plants in the United States. When he visited the plant of the LaPlant-Choate Mfg. Co., at Cedar Rapids, Iowa, where the 'dozer he used in battle was made, the employees voluntarily donated another bulldozer of exactly the same model, and the company followed suit by donating a second one. These were presented to the Navy Seabees and the U. S. Army Engineers and dedicated to Lt. Harold Goodwin, pilot and former employee of the company, who lost his life in the armed service.

Arc Welding Design Aid

An arc welding reference book and guide, in three volumes, entitled Practical Design for Arc Welding, has just been made available for distribution by Hobart Bros., Troy, Ohio, manufacturer of arc welding equipment. Designed as idea stimulators rather than text books, these volumes contain numerous suggestions, detailed drawings and concrete instructions for design through arc welding, applicable at the present time or for post-war production. A practical feature is the inclusion of a work sheet opposite every design plate, so that notes, estimates and sketches may be made most conveniently while consulting the reference material.

Sample pages of these books may be secured upon written application to Hobart Bros., and a complete copy on five days' approval may be secured, upon payment of postage. The cost of individual volumes is $3.50 each or $10.00 for the set of three volumes.

New Safety Device For Use on Cranes

Designed to provide positive protection against costly accidents resulting from raising crane booms beyond their safe elevation, the Thomas automatic boom stop control is an air or vacuum-operated system which disengages the main drive clutch instantly if the boom is raised above safe limits. The manufacturer states that this Thomas control is approved by the California Industrial Accident Commission and that it has been installed on over 200 cranes operating in shipyards, Army depots, and on other types of material-handling jobs.

A limit-control valve, mounted on the cab frame in line with one leg of the boom, is so placed as to operate on contact with the boom, as the boom approaches its maximum safe elevation. Operation of the valve immediately releases the air or vacuum pressure in the system, causing the spring-loaded clutch booster cylinder to disengage the clutch and stop further boom raising, doing so without shock and strain on heavily loaded booms.

Further information on the Thomas control may be secured by writing direct to the Industrial Equipment Co., 59th & Doyle Sts., Emeryville 8, Calif., and mentioning this magazine.

10-S MIXER
THIS MACHINE COMPLIES WITH A.G.C. STANDARDS
IT IS GUARANTEED TO HOLD AND PROPERLY MIX 10 CUBIC FEET OF CONCRETE PLUS 10% WHEN OPERATING ON THE LEVEL

"Here's the secret of my success"

SURE I get my fair share of business. Certainly my estimates are accurate and my time schedule "right on the nose." And it's all because my concrete mixers and pavers have that certain something that spells reliability in action and guaranteed capacity—the A.G.C. Rating Plate.

I know that when I estimate a job I can depend, *to the last yard,* on the capacity and performance of my mixers and pavers. I know what they can do and just how fast they can do it. That means something in these days of "get it done yesterday" schedules.

When I'm in the market for a mixer or a paver, you can just bet that it's got to have that A.G.C. Rating Plate.

MIXER MANUFACTURERS BUREAU

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EIGHT SIZES
Up to 1000 Tons per day
DRYERS
Two-Fire and Internal Fire
30 to 100 Tons per hour
Electric Batch Timers
50 Years' Experience
THE F. D. CUMMER & SON CO.
EAST 17th & EUCLID
CLEVELAND 15, OHIO

Details of Concreting On Texas Access Road

(*Continued from page* 25)

crete by means of a steel frame with V-notches in its lower end. Four other men on the Flex-Plane machine cut grooves 2½ inches deep for the dummy joints, set at 20-foot centers, and cut the groove and inserted the 2½-inch ribbon for the center division strip.

A Koehring Longitudinal Finisher followed the Flex-Plane machine, while two hand finishers with straight-edges and long-handled floats checked and improved the final surface, also hosing and belting it.

Two additional hand finishers, working jointly from a rolling bridge, pulled and edged the dummy joints and edged the expansion joints, whose surface was set ½ inch below the top of the pavement, as well as doing the side edging with long-handled edgers.

A double rolling bridge, with a working way parallel with the pavement, furnished an operating platform for the three men who applied the black-oxide center stripe. The dry powder was sprinkled between the sides of a metal frame, made of ¾-inch steel angles, laid on the fresh concrete with its position fixed by guide sticks extending from the side forms. This framework was 15 feet long and provided an opening 6 inches wide in which to form the center stripe. This was done by working the dry powder into the upper ½ inch of the concrete with a small pointed trowel, then finishing with a wooden hand float. It was done as soon as the surface moisture had disappeared and was usually complete within 100 feet of the finishers edging the joints.

Four 10-foot sections of 2-inch I-beams, with movable 2-inch iron strips hinged to their sides and a hole in the outer end for anchoring with form pins, were used on top of the forms to carry machines back over the pavement placed the afternoon before.

Curing and Pouring Joints

Two displacement pumps mounted on each side of a small Wisconsin engine were used alternately to apply the Hunt Process curing compound at the rate of one gallon to each 200 square feet of pavement. Three men working from a rolling bridge handled the previously distributed drums of curing compound and sprayed it on the pavement.

A crew of eight men pulled the forms the following morning, using two 2-wheel form jacks with 12-foot levers, which first pulled the pins and then raised the forms. They were loaded onto an International truck with a steel flatbed which transferred them ahead.

As soon as the forms had been pulled, four men poured the joints with asphalt, which had been heated in a 200-gallon Littleford asphalt kettle, through two job-built hopper-bottom pouring cans.

Major Quantities

Major quantities involved in this contract included the following items:

Common excavation	13,700	cu. yds.
9-7-9-inch concrete pavement	20,868	sq. yds.
Reinforcing steel in pavement	11,229	lbs.
Concrete in structures	6.70	cu. yds.
18-inch plain-concrete pipe	1,101	lin. ft.

An interesting feature of the job is that the majority of the 18-inch pipe was used for the construction of inverted siphons, from 133 to 147 feet long, to carry irrigation water across and under the highway.

Personnel

The contract for this 1.7-mile concrete access road near Harlingen, Texas, was awarded in February, 1944, by the Texas Highway Department, to Holland Page, Austin, Texas, on his low bid of $70,-315.79. Construction was started on March 16 and completed on May 10. Dave Hogan was Superintendent for the contractor. For the Texas Highway Department, the work was under the general supervision of J. W. Puckett, District Engineer, with S. R. Busby, Resident Engineer, assisted by J. S. Leyendecker, Field Engineer.

Riddell Appointments

Carl G. A. Schmidt has been appointed Sales Manager of the W. A. Riddell Corp. and the Hercules Roller Co., Bucyrus, Ohio, to take charge of the sales of the Warco line of construction machinery and Hercules road rollers. Mr. Schmidt, who went to Riddell directly from the Hercules Co. of Marion, Ohio, where he was Manager of Sales, was formerly Equipment Engineer for the Pennsylvania Department of Highways.

E. M. Ackerman, who has been associated with the Riddell Corp. for the past sixteen years, has been made Assistant Sales Manager in the Road Machinery Department.

RAPIDITY!

UNIFORMITY!

SATISFACTORY!

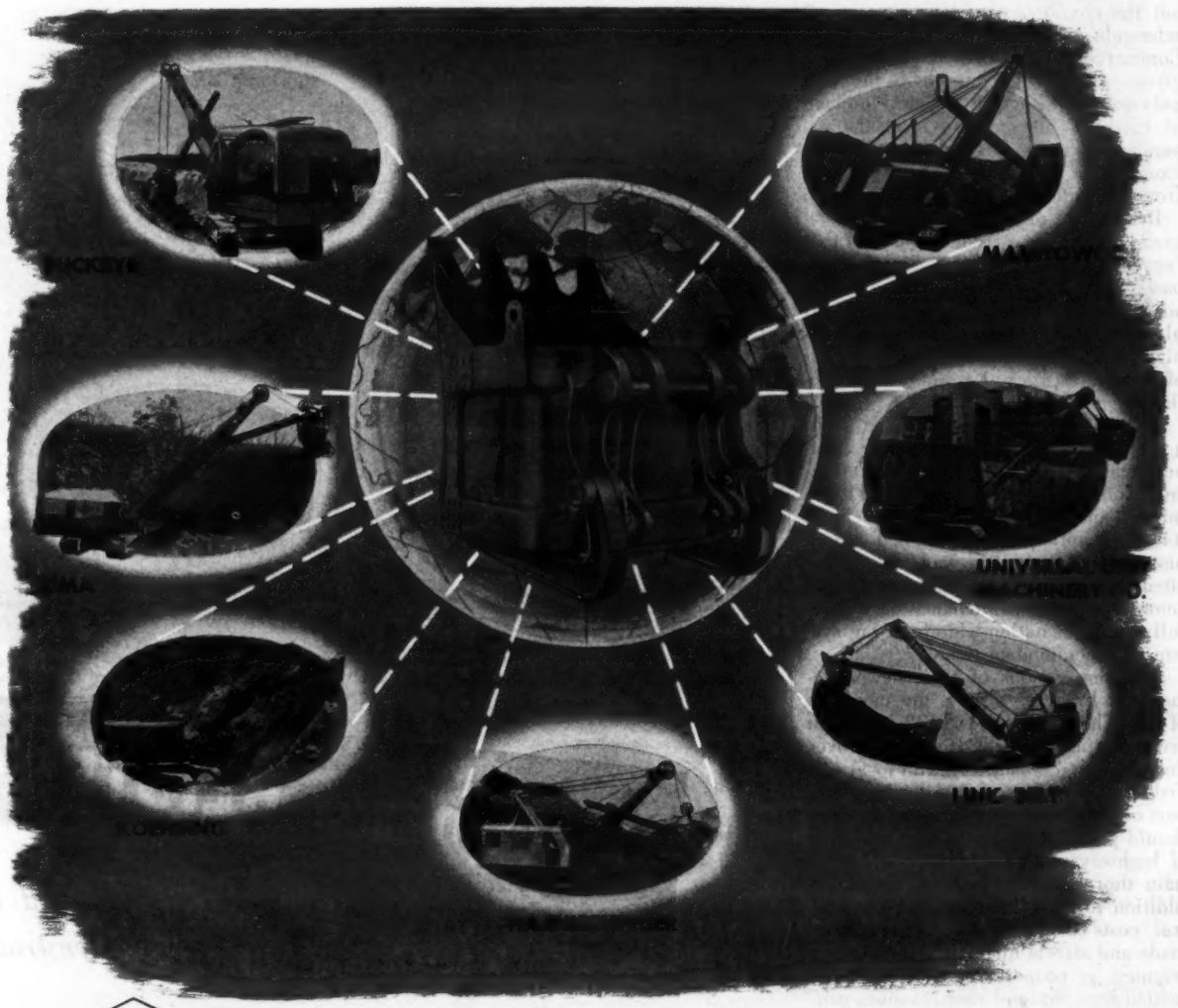
Contraction joints *MUST* or should be installed within the "opportune" limited time of ten minutes; this requires speed and proper machinery. All Engineers know how disastrous it is to work concrete too wet or too dry.

"FLEX-PLANE" mechanical joint installers for all types of joints—ribbon, premoulded, poured, cork, rubber, etc.

Ask for Bulletin E-11; it "portrays" other things you know!

FLEXIBLE ROAD JOINT MACHINE COMPANY

WARREN, OHIO, U. S. A.



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all over the world are making good shovels better. Weight saved in the dipper by welded construction enables shovel engineers to make more efficient, faster digging shovels.

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Established 1880

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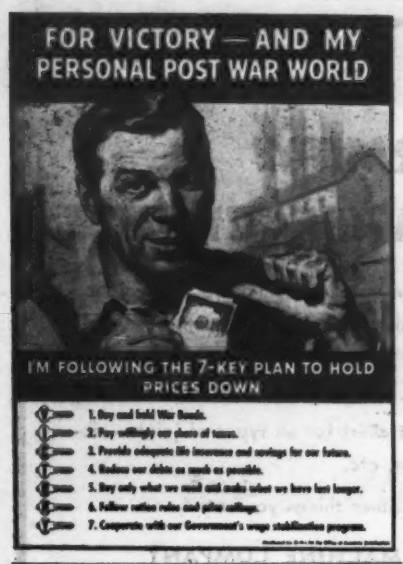
We operate the largest and most complete manganese steel foundry in the United States.


FOR VICTORY — AND MY PERSONAL POST WAR WORLD
I'M FOLLOWING THE 7-KEY PLAN TO HOLD PRICES DOWN
1. Buy and hold War Bonds.
2. Pay willingly our share of taxes.
3. Provide adequate life insurance and savings for our future.
4. Reduce our debts as much as possible.
5. Buy only what we need and make what we have last longer.
6. Follow ration rules and price ceilings.
7. Cooperate with our Government's wage stabilization program.

Business Groups Favor Sound Road Policies

Local business organizations throughout the country, voting in a series of referenda submitted by the Chamber of Commerce of the United States, have given overwhelming support to highway policies providing for the development of facilities adequate to meet the expanded requirements of the post-war economy, according to a recent bulletin from the Automotive Safety Foundation.

By a vote of 2,207 to 6, the local groups approved a recommendation that "specific highway programs should be based on comprehensive surveys giving adequate consideration to an overall plan, to the economic benefits of each highway, and to the proper relationship of the entire program to the whole public budget".

This was the first recommendation in a list of thirteen submitted to the Chamber's membership by its Transportation and Communication Department Committee, and it was accompanied by a statement anticipating expanded use of motor vehicles after the war, and calling attention to the "increasing need for completion and maintenance of a carefully planned nation-wide highway system to accommodate them".

In other sections of their new statement on highway policy, the members of the Chamber voted 2,172 to 48 in favor of state highway supervision over the program, cooperating with local and Federal authorities; 2,205 to 7 in support of a declaration that highway users should pay "the major part of the costs of highways of general use, including main thoroughfares in urban areas, in addition to their fair share of the general costs of government, with local roads and streets financed from general revenues or property assessments, augmented by a share of user revenues proportional to use"; and 2,200 to 21 in favor of special taxes or fees "based on logical standards reasonably commensurate with the value of use" for highway-user contributions, and in opposition to the diversion of these proceeds from highway purposes. The vote was 2,163 to 41 for the proposition that "bond issues should not be employed for highways of general use, unless an adequate program is impossible from current highway revenues, and should in general be avoided for locals roads"; and 2,195 to 21 were in favor of a definition of the Federal government's function in highway development as "primarily one of coordination in the interests of interstate commerce".

The largest negative vote against any of the policies submitted by the Committee was 107 as compared with 2,107 in favor of allotments of Federal Aid among the states on the basis, among other factors, of "traffic volume and needs as determined by comprehensive surveys". There were 2,091 votes to 98 in support of at least equal matching by the states of Federal funds with exceptions when reasonably necessary in states containing large areas of the public domain; 2,116 to 79 in favor of retaining jurisdiction for land acquisition in the hands of the states and of encouraging them to acquire "reasonable amounts of adjoining land and property to avoid damage claims or to establish and protect freeways and parkways"; and 2,198 to 23 for the encouragement, as a state or local responsibility, of "establishment and maintenance of off-street parking facilities or other highway accessories to facilitate traffic flow".

That safety should be a prime requirement in all highway programs, not only through road improvements, but also through protective devices, adequate administration, law enforcement exclusively by state and local authorities, and education of highway users was supported by a vote of 2,215 to 11. There were 2,189 votes to 20 in favor of a continuous post-war program for rail-highway grade-crossing elimination, with costs assessed according to benefits; and 2,210 to 6 in support of the position that "all Federal Aid for highways should be administered by a single Federal agency working exclusively with the state highway departments".

A Look up the Road

This is the title of a new 16-page booklet, in two colors, recently issued by the Caterpillar Tractor Co., Peoria, Ill., to aid state, county and municipal highway and street officials in the problems which they will face in the period following the war. It is designed to show the role which can be played by Caterpillar equipment in reconditioning old and constructing new highways. Copies of this booklet, Form No. 8587, may be secured by those interested direct from the company. Just mention this item.

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Salt and Safety On Mass. Roads

Towns and State Find Rock Salt Effective and Economical in Keeping Routes Open in Winter

✦ PUBLIC demand for better, more comprehensive year-round highway-maintenance programs has resulted in vastly better winter driving conditions than prevailed a decade ago. Even today, in the face of wartime restrictions and shortages, the program of improvement is going forward. The strides are most discernible outside densely populated areas where the private car is almost indispensable to the pattern of living.

Perhaps nowhere in the East are public officials paying more attention to keeping the highway network open and safe in all weather than in the Commonwealth of Massachusetts. The realization that today the scope of winter maintenance must be extended is the reason for this interest. As the National Safety Council's Committee on Winter Hazards points out, not only is the highway engineer charged with preventing traffic interruption during and after a storm, but he must also assume the responsibility of cutting down the toll of winter accidents.

Faced with a shortage of labor, reduced budgets, and insufficient equipment to do a complete job, this is a big assignment. In many cases, Massachusetts communities have followed the lead of a number of major cities and are adopting rock-salt treatment for snow and ice removal, and it is reported that they are getting results.

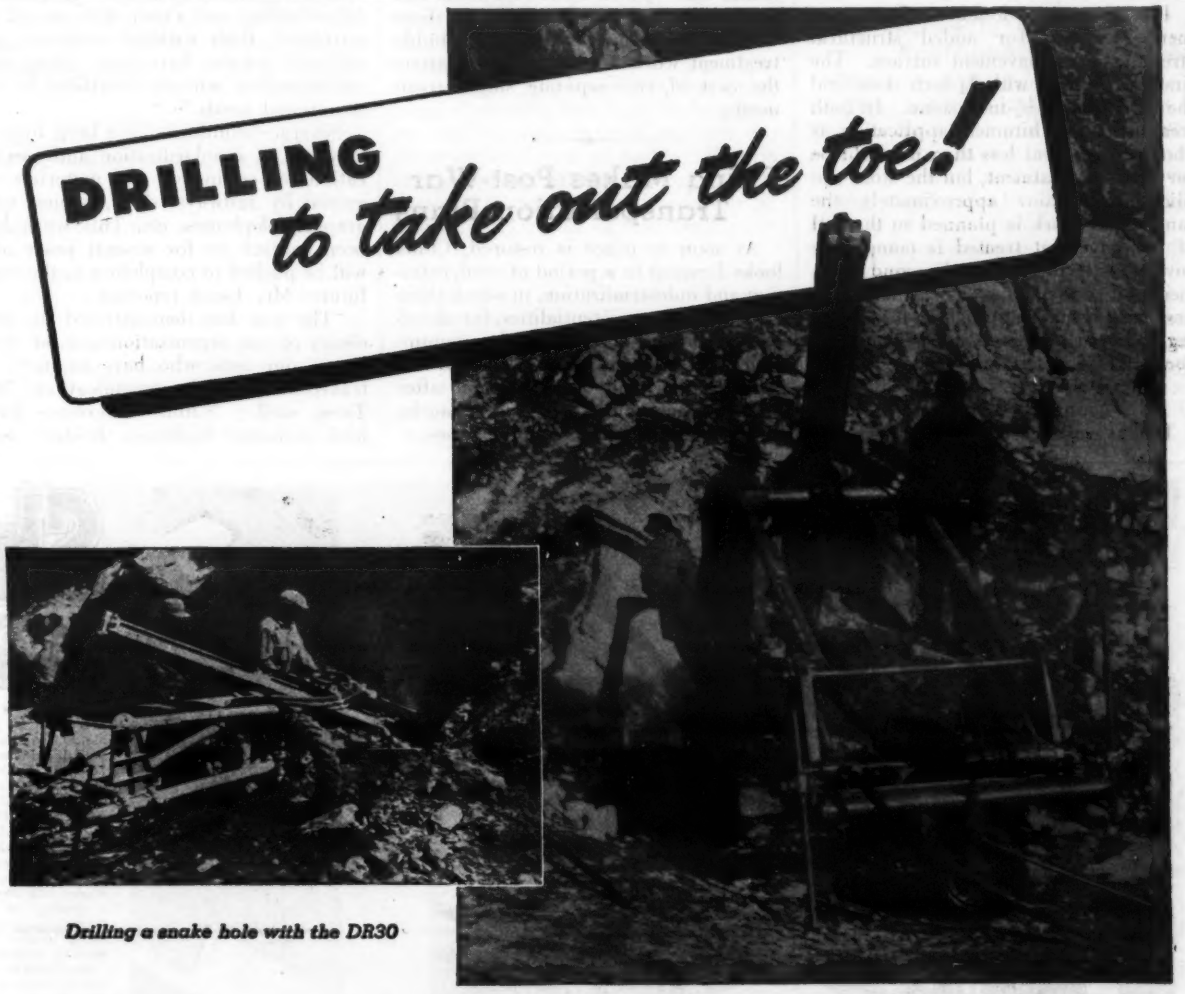
North Adams' Experience

North Adams, in the Berkshire region of western Massachusetts, was one of the first to employ the technique of using straight rock salt on its main thoroughfares, according to J. F. Dineen, acting Superintendent of Highways. Before the introduction of straight salting, ice 2 feet thick sometimes formed on the principal streets, causing traffic delays, imperilling motorists, and necessitating the expenditure of a great deal of money in attempts to dislodge the mass with hand labor. Since rock salt has been used, it is reported that not only is improvement evident but also that businessmen and residents are proud of the bare pavements achieved so quickly after a storm.

Because of heavy snowfalls in this mountainous northwestern corner of the state, which last year measured 160 inches, a crew of twenty men is kept occupied removing snow on the city's 75 miles of streets. In the past, as many as fifty men working 16 hours at a stretch have been used to fight a heavy fall, but Mr. Dineen believes it will be possible, without much extra help, to weather the severest blow winter can deal by getting their seven plows into operation at the outset of the storm and keeping at it uninterruptedly.

Before the snow has reached a depth of 2 inches, two men riding in the back of a slowly moving truck distribute shovelfuls of rock salt over the entire width of the street, at the rate of ¼ pound per square yard throughout the business section. Within a short time after the plows have cleared away the subsequent fall, the rock-salt crystals have bored through the snow, breaking up the compacted mass. The brine formed from the dissolving salt undercuts the snow layer and keeps it from freezing fast to the street surface. Then a tractor piles up the snow so that a Barber-Greene loader can easily deliver it to trucks for hauling away. It is re-

(*Concluded on page 79*)



Drilling a snake hole with the DR30

CLEVELAND DR30 Wagon Drills, in addition to having plenty of speed and stamina, are also remarkably maneuverable. They drill readily in any position and at any angle—straight down, flat, breast high, higher than your head, or within 4″ of ground level—even straight up when necessary.

The DR30 has a recoil device to increase cutting speed. The forward leg point steadies the drill. Other important features include a handy centralizer to keep the steel from "walking" while starting a hole. Also a double-screw jack for moving the U-bar. With a feed capacity of more than 8 feet, the DR30 handles depths to 25 feet and more.

Bulletin 132, sent upon request, explains why the DR30 is the most popular wagon drill ever built.

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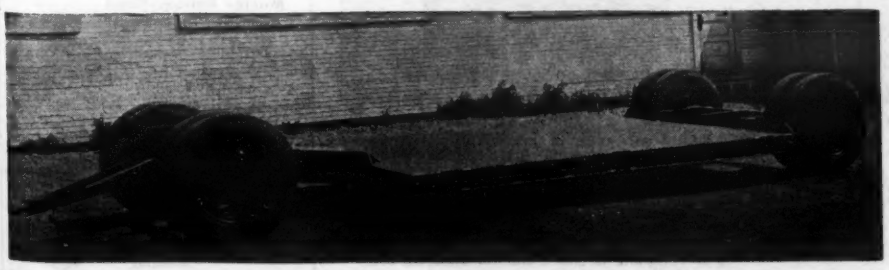

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Conn. Improves Roads With Stone Surfacing

(*Continued from page 30*)

25 pounds per square yard for ½-inch.

Double Treatment

In some cases, double surface treatment is given for added structural strength of the pavement surface. The first treatment is with ¾-inch stone and the second with ½-inch stone. In both treatments the bitumen application is about 20 per cent less than it would be for a single treatment, but the stone application remains approximately the same. The work is planned so that all of the pavement treated is completely covered with the first and second treatments on the same day. In general, the first treatment is applied in the morning followed by the second in the afternoon.

Costs

The average cost of surfacing with gravel is about 6 cents per square yard for a complete single treatment, while for trap rock it is about 8½ cents per square yard. As ¾-inch stone is somewhat more difficult to handle, besides requiring greater quantities per square yard of both bitumen and stone, treatments with ¾-inch stone cost about one cent per square yard more than those with ½-inch stone. The cost of double treatment work is about three quarters the cost of two separate single treatments.

China Makes Post-War Transportation Plans

As soon as peace is restored, China looks forward to a period of modernization and industrialization, in which there are tremendous potentialities for development in transportation and communications, and plans have been laid for rehabilitation and reconstruction after the war, according to Tseng Yang-fu, Chinese Minister of Communications.

Mr. Tseng, in a recent address in Chungking, said, "We have formulated a plan for a national transportation system, in which railroads, highways, waterways and airways are duly mapped out and coordinated, and a national communication system in which telegraph, radio, city and long-distance telephones, broadcasting, and a post office are all interrelated. Both national economy and national defense have been taken into consideration without sacrifices to international needs."

Several committees have been formed to work on standardization and specifications of equipment and materials required by railways, ships, planes, telegraphs, telephones, etc. This work has been carried on for several years and will be pushed to completion in the near future, Mr. Tseng reported.

"The war has demonstrated the efficiency of our organization and the ability of our men who have engaged in transportation and communication," Mr. Tseng said. "China's engineers have built railways, highways, bridges, tunnels, and airfields, with commendable speed and standards. Transportation men have shown skill and bravery in handling military movements during the various critical stages of the war. Our past record is gratifying. However, in view of the magnitude of post-war reconstruction, China requires many more engineers and experts than we have today. We have arranged to send some students to study abroad. Cooperation and assistance of the Allied governments, industries, and transportation firms will be most welcome".

Speaking of Generalissimo Chiang's new book "China's Destiny", Mr. Tseng said that foreign capital in the form of machinery and materials will be greatly needed and always welcome in China, provided that investment is made in consistency with the principle of equality. Foreign technical assistance is also needed and will be welcomed. "A modernized China," Mr. Tseng concluded, "will be a great step forward in the rehabilitation and reconstruction of the new world."

This Native is Carrying War Supplies Wrapped in

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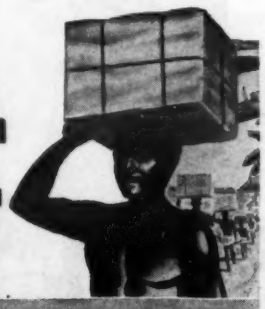

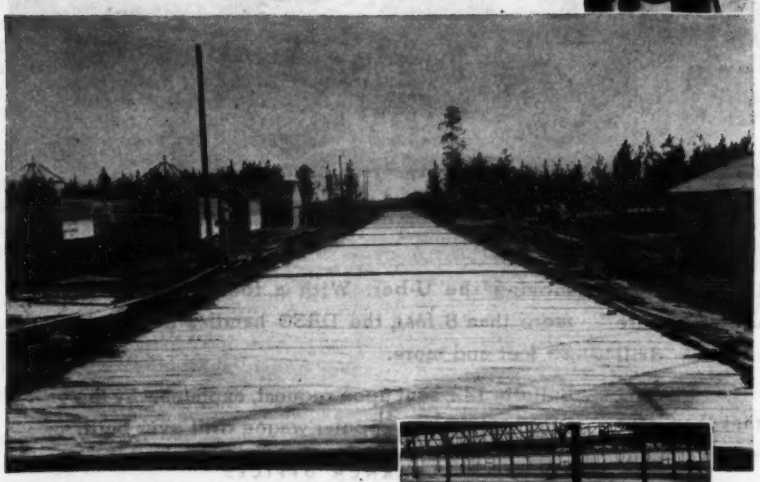

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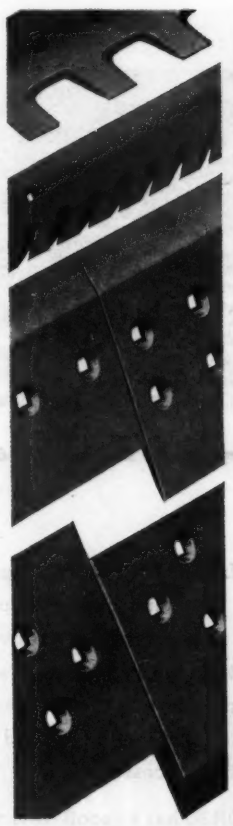

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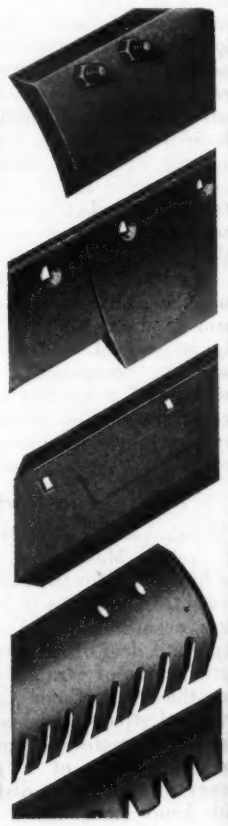

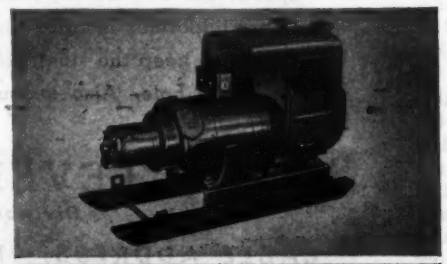

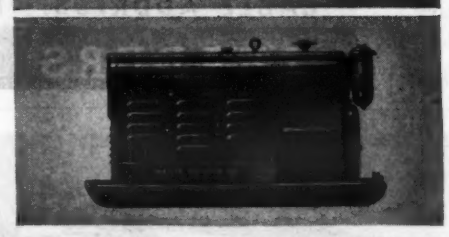

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Official U. S. Navy Photo

On Tarawa Island in the Gilberts, Caterpillar D6 tractors with LaPlant-Choate bulldozers level a landing strip for use by U. S. planes: The conquest of Tarawa gave the United States another "stationary aircraft carrier" from which to launch raids against the Japanese.

Details of War Work Revealed by Somervell

The greatest chapter in world construction history was written in the $11,000,000,000 program, comprising 19,000 projects, which was completed by American contractors in the interval between June, 1940, and D-Day, says Lt.-General Brehon Somervell, Commanding General, Army Service Forces, in an article in the July issue of *The Constructor*, published by the Associated General Contractors of America. This article outlines for the first time the details of the nation's war construction program and the results attained.

"Now that so large a percentage of our troops are overseas and most of our facilities for manufacturing are finished, one can look at the construction program in the United States as a whole," General Somervell says. "The conclusion is being written for the most brilliant chapter in world construction history, a chapter that will stand credit to the construction industry and to all others who had a part in the prosecution of this essential emergency program. It was the prelude to training, equipping and supplying the Army. Volumes will be required to record the details of this program, the purposes to be met, the magnificent cooperation all down the line, the problems overcome, the methods developed, and the full influence of the program in the primary purpose of winning the war."

About one-fifth of the total program was defense construction, the contracts for which were placed prior to Pearl Harbor. Since that date some $8,500,000,000 of projects have been completed. These included camps, hospitals, depots, assembly plants, manufacturing facilities, air bases, schools, ports, fortifications, highways, bridges and railroads.

The General said that the first problem of national defense was the need to combine the elements consisting of most of the essential raw materials, a vast reservoir of man-power, technological and scientific skills and a traditional ability to improvise brilliantly in time of emergency into a vast army of effective specialists with the best weapons any army ever had.

When the defense phase of the program ended in December, 1941, more than 600 different projects, at a cost of about $2,488,000,000, had been undertaken. During the period from December 16, 1941, to March 15, 1942, more than $2,000,000,000 of new work was authorized and about $570,000,000 of this amount represented construction in place. At the end of this period, the total construction program authorized was estimated to cost more than $5,200,000,000, of which 55 per cent was in place. Throughout the remainder of that fiscal year, the construction program continued to accelerate until it reached its greatest momentum in July. From March 15 to the end of June, 1942, almost $1,500,000,000 of construction was put in place.

During this last year, because of the changing character of the war, seacoast fortification construction was curtailed and passive protection construction was terminated. Outside of continental United States, construction programs including strategic and access roads to military installations have been completed and maintenance and operational crews are now functioning. Special projects now constitute the major items of construction, such as lengthening and strengthening of runways for the accommodation of heavier aircraft, and additional storage, transportation, port and processing facilities for the increasing movement of men and materials overseas.

"Before Pearl Harbor," General Somervell said, "Air Forces construction amounted to about $471,000,000. Since then it has risen to about $2,500,000,000. The value of troop-facility construction has amounted to about $1,800,000,000. Almost $2,200,000,000 has been spent in the construction of munitions manufacturing plants. Without exception, the capacities of all munition assembly lines far exceeds original estimates. Due credit for completing this program in the limited period available belongs to the architect-engineers, construction contractors, and organized labor."

Fifth Highway Congress Postponed to October

The Fifth Pan American Highway Congress, scheduled to meet in Lima, Peru, in July, was postponed and will now be held from October 12-22, according to a recent announcement. Delegates, including highway officials, engineers, contractors, automobile and tire manufacturers, oil producers, and automobile association representatives, from the republics of the western hemisphere and the Dominion of Canada, will emphasize the adoption of a hemisphere-wide highway code which will include construction, maintenance, legislation, traffic, financing and administration of roads, and post-war communications.

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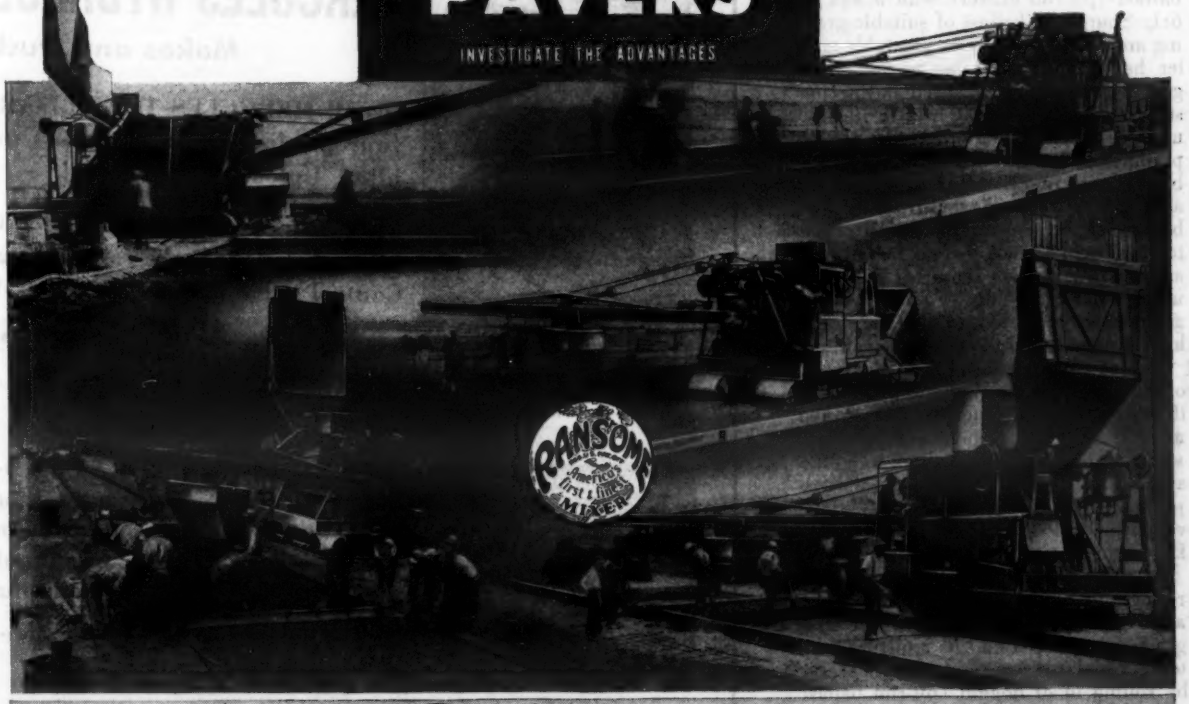

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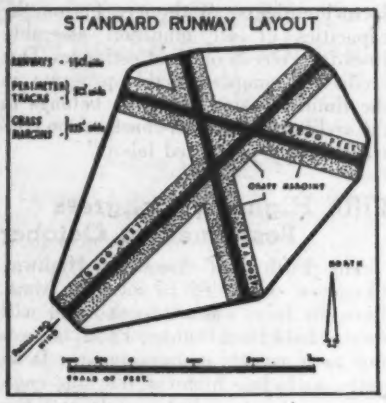

Vast Airfield Program Completed in Britain

(*Continued from page* 43)

for a take-off surface for any aircraft then in service, but the war made aircraft grow apace and the advent of the "heavies" made the grass, which persists throughout the year in Britain's moist climate, insufficient to carry increased wheel loads.

It was therefore decided to construct concrete runways and tracks, with a surface area of many thousands of square yards for each new airfield planned. Then in 1940 there was launched an increased and accelerated program involving the construction of hundreds of airfields of this type, at a time when things looked black for Britain, when invasion was expected, and when suitable workmen were becoming scarcer and scarcer due to the needs of the fighting services.

However, Engineering and Drawing Office staffs of the Air Ministry went their way to work each morning, often through the debris of the London blitz, sometimes having to make wide detours around areas roped-off on account of unexploded bombs. Drawings and specifications were prepared, contracts were let and, finally, the mammoth project got under way in spite of the besetting difficulties of a country involved in total war.

Construction

Runways, perimeter tracks and hardstandings were laid down with mass concrete 6 inches thick, using "all-in" ballast (pit-run gravel) with a mix of 6:1. Sources of ballast of suitable grading and free from clay or vegetable matter had to be found, as washing and grading would have slowed down construction to an extent which, in the urgency of the situation, could not be permitted. In all, 30,000,000 tons of ballast went into the construction of the airfields. It was excavated from the pits by face-shovel or dragline and trucked to the sites in 3-tonners along main roads and narrow English lanes for distances usually not exceeding 30 miles. As all gasoline is imported to Britain, road-haul distances had to be minimized.

United States industry provided most of the scrapers and bulldozers used in the excavation and grading. Many of the airfield sites in Britain are in areas where sticky clay forms the subgrade and in the wintertime, mud abounds to provide very difficult going, as will be vouched for by U. S. Engineers in the European Theater of Operations.

In the consolidation of the subgrade, rollers up to 12 tons in weight were allowed, according to the type of subgrade encountered and its moisture content. Final preparation was generally by rolling in of hoggin (pit-run ballast with high clay-binder content), to a compacted thickness of 2 inches. Ashes or cinders were also used at times when a source was reasonably near, but with the bad subgrades encountered during the winter months an underlay (base course) of 3 to 4 inches of 12:1 concrete was put down ahead of the top slab.

It may be of interest to mention that the Luftwaffe at times helped to deal with the difficult subgrade conditions in that it provided large quantities of blitz hardcore (rubble) from neighboring big towns, London being by far the largest contributor, for use as base course.

Every airfield site in the country had to be intensively drained to insure that the water table under all paved surfaces did not cause the subgrade to become unstable. The run-off from many thousands of square yards of paving is not inconsiderable, and this was dealt with by leading it into adjacent streams and rivers which sometimes had to be regraded for miles from the main outfall.

Concrete Paving

The concrete mixing method most favored by contractors in Britain is the use of two or more large stockpiles of aggregate situated alongside batching hoppers. These discharge into continuous-type horizontal drum mixers with worm cement feed, the mixed concrete being trucked straight out to the job. Pumping methods have been tried out, but have not been an improvement on any of the more usual methods. For all paving work, the standard metal forms were used.

The record figure for concrete paving in runways is 180,000 square yards in one month, attained on one airfield where mechanical spreading and finishing were employed.

Buildings

On the airfield buildings every advantage was taken of prefabrication by mass-production methods. The basic type of building employed was the Nissen hut in spans of 16, 24, and 30 feet, but many other types of huts, anything that would save precious man-

(*Concluded on next page*)

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HYDRAULIC HOISTS and DUMP BODIES

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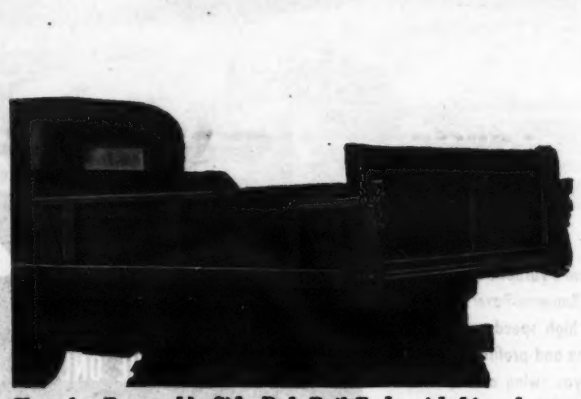
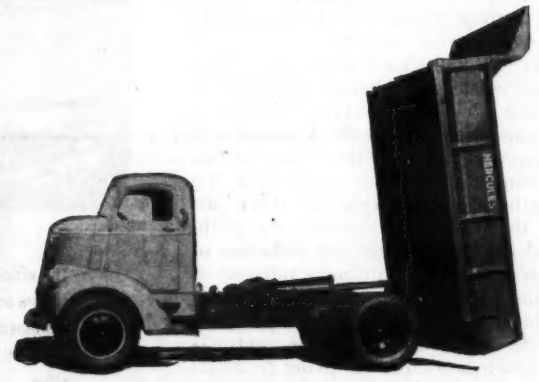


Hercules Removable Side Rub Rail Body with hinged rear corner posts. Available in many sizes.



Hercules High Dumper—Power up, power down with 78° dumping angle. Equipped with 12 ton capacity hoist.

HERCULES HYDRAULIC BOOSTER HOIST

Makes any truck a Dump Truck

Install HERCULES DOUBLE-ARM HYDRAULIC HOISTS under your platform, stake, express or special bodies, which are now idle. Unload the easy way!

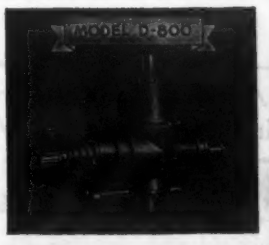
This is the Model KXE Hoist, with 6" cylinder, for bodies up to 12 feet long. Body reinforcing plate and steel sills included. Control valve is operated from driver's seat.

USE THE HERCULES SPLIT-SHAFT POWER TAKE-OFF

To operate any truck-mounted equipment

Direct (D-700 Series), Side (D-800 Series) and Dual Drive (B) models are available for operation of almost every possible type of truck-mounted equipment, either singly or in combination.

Recommendations and complete specifications upon request.



HERCULES STEEL PRODUCTS CO.

GALION, OHIO

Standardization Aids Airport Construction

(*Continued from preceding page*)

hours, were also used. A standard-type hangar of 114-foot span and light construction was produced in very large numbers and has proved one of the most successful of the temporary buildings.

Those buildings which did not lend themselves to prefabricated construction were erected of 4½-inch-thick brickwork, steel trusses, and corrugated asbestos roofs. All brickwork has to be cement-rendered externally to keep out the English weather. The use of every form of imported material was reduced to a minimum. This applied particularly to timber, of which Britain can grow but a small proportion of her wartime needs.

Standardization Helped

The underlying principle of this colossal program, which has borne fruit in the 2,000-bomber-and-fighter-escort raids over Europe by the R. A. F. and the U. S. A. A. F. is "standardization". This has eased the acute problems of shortages of labor and materials; without it, such a project, conceived as it was in the grand manner, would have been impossible.

The controller of Britain's Air Ministry Works organization is E. Holloway, C.B.E., O.B.E., Director-General. Mr. Holloway is a member of the Institution of Civil Engineers and of the Institution of Mechanical and Civil Engineers and, at the same time, a civil servant who has seen more than 25 years' service with the Air Ministry, both in Britain and overseas. On him and his organization depends to a large measure the safety of pilots and aircraft in Britain and in many British territories throughout the world.

Relief work in the reconversion period will not be necessary if industrial conversion is backed up by an adequate backlog of highway and other public construction.

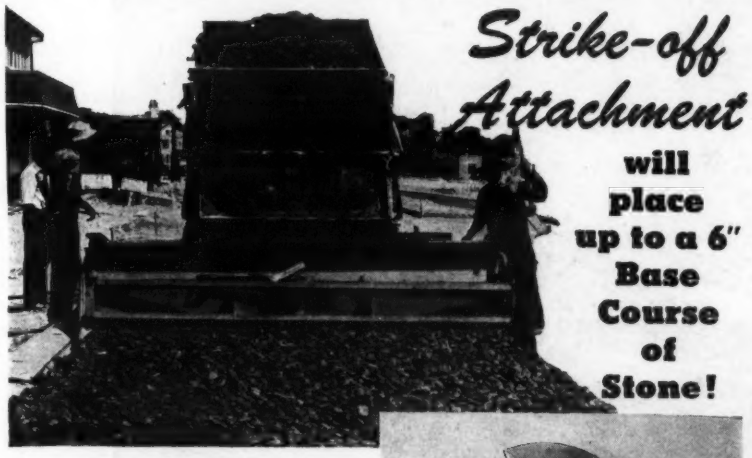
Multi-Contact Timer For Remote Control

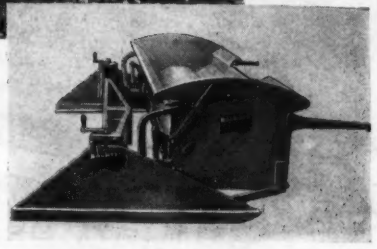
A new multi-contact timer for remote control has just been placed on the market by The R. W. Cramer Co., Inc., Centerbrook, Conn., and is designed to control a series of machine operations in definite order; automatically to reverse or alternate in operation a group of motors, machines, or devices; to operate in a predetermined sequence a series of signals, valves or solenoids; as well as numerous other applications where sequence operations are of prime importance.

Its solenoid starting mechanism is operated from a remote-control momentary start button, so that the timer will go through its complete cycle or any part of its cycle of operation and stop. Reclosing the momentary start button either continues or repeats the cycle, as the case may be. They can be arranged so that, in the event of a power interruption, it is necessary to press the remote-control start button again to continue the cycle, or after power is restored automatically to continue the cycle of operation.

Further information on this new multi-contact timer may be secured by those interested direct from the manufacturer.

A BUCKEYE SPREADER and Strike-off Attachment will place up to a 6" Base Course of Stone!





BY simply removing the feed roll of a standard Buckeye Spreader and attaching a Buckeye Strike-off Attachment you have a heavy duty unit for accurate placing of base courses of heavy stone. The Strike-off is adjustable by hand cranks for different depths and rides on skids 5 ft. long by 4 in. wide insuring uniform width and depth of spread. Complete data and specifications on the Buckeye Spreader and the Strike-off in *8-page bulletin available on request.* BUCKEYE TRACTION DITCHER COMPANY, Findlay, Ohio. *Earthmoving and Road Building Machinery for Over 50 Years.*

Buckeye

Power Finegraders · Trenchers · Tractor Equipment · Road Wideners · Convertible Shovels · Spreaders

LOOK AHEAD

Studies of business cycles show that in prosperous times approximately 12% of our national income has been generated by the construction industry. When construction volume has fallen much below this, a downward spiral toward depression has resulted. Control construction and you hold the key to economic balance. Every dollar invested in construction adds to the national wealth. Highway officials, contractors and business leaders should organize now to be ready with public works plans when the war is over.

Buckeye

HEIL Cable Scrapers are fast-loading and unload cleaner with less cable pull

Dependable Power Control Units for all makes of tractors

Smooth-operating brake and clutch assemblies eliminate shocks and jerks; the large drums run cool; the sheaves are designed to reduce wear on cables. Fingertip control gives lightning-fast response for bigger yardage. Designed for all types of cable-operated equipment on all makes of tractors.

Write for bulletins.

See your International TracTracTor Dealer

You can pick up heaping bonus loads easier and faster with this efficient Heil Cable Scraper — because it "bites deep" in hard-packed soil just as easily as it loads loose soils like sand.

For improved scraper performance, experienced Heil engineers have developed a scientifically located draft pivot-point, tilting-floor push-out, contoured bowl design, all-welded sections, and many other features that add up to bigger yardage at lower costs. Investigate now and be prepared for postwar equipment purchases.

Write for bulletins.

R-35

ARMY E NAVY THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

FIGHT WASTE!

USE LESS ★ ★ ★ ★ ★ So Our Fighting Forces Will Have More

Raybestos Enlarges Its Sales Personnel

Personnel changes made as part of a general post-war plan to fortify the sales structure of The Raybestos Division, Raybestos-Manhattan, Inc., Bridgeport, Conn., have been announced. Norman Leeds, Jr., formerly Replacement Sales Manager, becomes General Sales Manager; Sidney E. Shepard, previously Sales Promotion and Advertising Manager, is now Director of Replacement Sales; and James L. McGovern, Jr., who was Eastern Zone Manager, becomes Supervisor of Replacement Field Sales.

Other appointments include those of Jerome W. Brush, Jr., as Manager of the Rubber Products Department; A. A. Woodruff, Jr., Manager of the Industrial Products Department; Frank Crook as Manager of Transportation Sales, and C. T. Begg as Director of Service Sales.

Allis-Chalmers Tractor Featured in New Film

Once more the lowly tractor-bulldozer outfit reaches new heights of heroic action and glory. We have had many stories of its service with the armed forces, and the latest is a dramatization of such action in Columbia's new film "Mr. Winkle Goes to War". In it, Mr. Winkle, played by Edward G. Robinson, is a timid bank clerk who eventually finds himself with the Army on a South Pacific island. In the line of duty, Pvt. Winkle is sent to a desolate spot to repair an Allis-Chalmers tractor equipped with a bulldozer which is stuck in the mud. The Japs attack. Almost instantaneously Pvt. Winkle gets the tractor repaired and jumps into the driver's seat, heads the bulldozer for the pillbox in which the Japs are hiding, and plows them under. This heroic action accounts for forty-four Japs, and honors are heaped on Mr. Winkle.

The tractor used for this scene in the film is an Allis-Chalmers HD-14 model equipped with a bulldozer.

New Folder on Diesels

A new 8-page folder describing and illustrating the features of Murphy diesel engines, which are available in various sizes and models for all types of applications in the construction field, may be secured direct from the Murphy Diesel Co., 5319 W. Burnham St., Milwaukee 14, Wis. Just mention CONTRACTORS AND ENGINEERS MONTHLY.

THIS is the home of national champions. They earned their title because of superior performance, teamwork, and the will to win.

Building a strong, safe, and permanent stadium like this requires similar qualities. The cooperation and spirit are American free enterprise which developed the equipment for producing huge quantities of low cost aggregates able to meet strict specifications. Such aggregate is produced by Cedarapids crushing equipment which has been constantly improved to provide the utmost in quality of products, low cost, and volume of production.

When you are figuring peacetime contracts for highways, airports or other engineering construction, that have made America strong, base your estimate on aggregate produced by Cedarapids equipment. Even though a large part of Iowa's production is still going to war you can always get more Cedarapids equipment for essential civilian use. Let us help you with the necessary releases and priorities. Come to Iowa, first, the home of Cedarapids aggregate producing and crushing equipment.

THE IOWA LINE
of Material Handling Equipment Includes

ROCK AND GRAVEL CRUSHERS
BELT CONVEYORS—STEEL BINS
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VIBRATOR AND REVOLVING SCREENS
STRAIGHT LINE ROCK AND GRAVEL PLANTS
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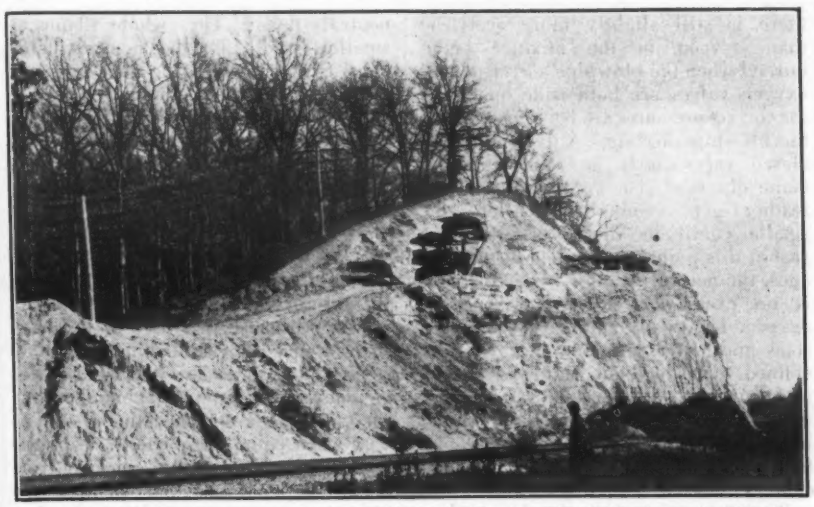
PORTABLE POWER CONVEYORS
PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS
TRAVELING (ROAD MIX) PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS
KUBIT IMPACT BREAKERS

IOWA MANUF[illegible]NG COMPANY
CEDA[illegible]DS, IOWA



An Athey MobiLoader removes a hazard from Burlington RR right-of-way in Illinois.

U.S. Engineers Order A New 12-Inch Dredge

A new 12-inch hydraulic dredge, completely integrated, of very compact design and fully equipped to operate in isolated locations for long periods, is being built by the American Steel Dredge Co., Inc., Fort Wayne, Ind., for the U. S. Engineer Corps. This dredge, one of a number of these diesel-powered units being built for the Engineers, requires no supply service except for fuel oil, lubrication oil, and sustenance for personnel. It is designed to handle sand, clay and silt to a depth of 16 feet and deliver the material through a maximum of 1,000 feet of discharge line at water level, or 500 feet of discharge line at 30-foot elevation.

The general specifications call for a main dredging pump with a 14-inch suction and 12-inch discharge pipe, powered by an 8-cylinder 320-hp diesel engine; a main power plant consisting of an 85-kw diesel electric-generator set; and an auxiliary diesel power plant of 6 kw.

The 104 x 29 x 6-foot prefabricated steel hull is an adaptation of the bolted sectional barge that the company has been producing for the Army Transportation Corps for more than a year. The bolted steel hull enables shipment of the complete dredge on standard railroad cars and as hold cargo to overseas destinations. Even for this large dredge no deck space is needed for its transportation, and no fabrication is necessary at the site of erection. Its prefabricated steel plates and all other panels and sections join easily, and when the last bolt is in, the hulls are completely watertight. When the dredge has served its purpose in one location, it is possible to dismantle it and ship it to another site. Complete manuals on assembly, operation and maintenance are provided with each dredge so that personnel, who perhaps never saw a dredge before, can assemble it and have it in operation in an amazingly short time. A wooden deck house enclosing all machinery is also prefabricated to facilitate shipment. The deck house measures approximately 72 x 20 feet x 10 feet 8 inches.

The dredge has a 36-foot digging ladder provided with an adequate margin of overload capacity, and can be fitted with interchangeable cutter heads to meet the changing character of material. The unit is equipped with a five-drum hoist which enables extremely high rope pull at low speeds due to special compound gearing. Cone friction clutches are used and a drum switch controlling the hoist makes its operation very flexible.

The American Steel Dredge Co., Fort Wayne, Ind., has been fabricating this general type of unit for more than 40 years in sizes up to 20-inch and designed for all-electric or steam power. , Its equipment is used on dredging operations in all parts of the world, and shore fills on lakes and rivers, drainage projects, channel and canal improvements, cleaning and enlarging reservoirs, building dams, embankments and levees, as well as hydraulic mining and recovery operations.

New DeVilbiss Officials

The election of Howard P. DeVilbiss as President and General Manager and of Allen D. Gutchess as Chairman of the Board and active senior executive of The DeVilbiss Co., Toledo, Ohio, was announced recently. The new President had served for several years as Vice President. Mr. Gutchess, President since 1929, succeeds W. M. Booker, who will continue as a member of the board.

Coincident with these changes, Frank A. Bailey, Vice President and General Manager, who has been with the company for thirty-four years, is retiring because of poor health, and Roy A. Guyer, Vice President in charge of sales, becomes a Director. The company has also announced the appointment of Don J. Peeps, of the engineering staff, as Acting Chief Engineer.

Model NH5W with 4-30,000 C.P. floodlights.

The NITE-HAWK Gives You:

LIGHT—Where you want it—when you want it.

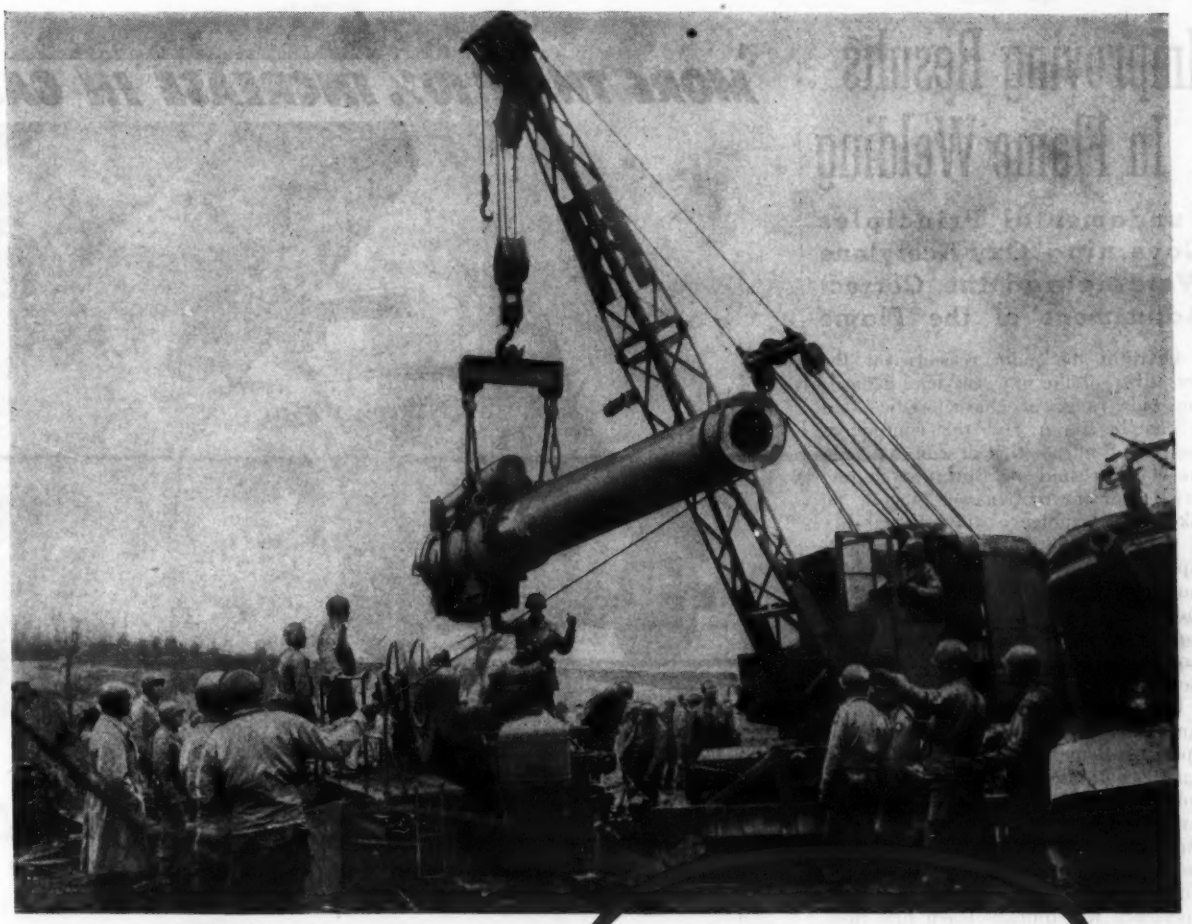
POWER—To operate hand tools—saws, drills, hammers, etc.

Floodlight and Searchlight Units up to 14 million candlepower.

Write for Bulletin 161

LISTER-BLACKSTONE, Inc.

1706 So. 68th Street MILWAUKEE, WIS.



Roping A HOWITZER

SPEEDY field-assembly of heavy 240-mm. howitzers . . . the biggest mobile artillery short of railway guns . . . demands a high degree of team-work and "know-how." Well-conditioned wire rope also plays an important part in the ease with which these mammoth weapons are swung into position.

That is just one of countless jobs, in the Army and throughout industry, where wire rope helps step up performance efficiency. Contractors everywhere know that a sure way to keep their wire rope flexible and protected against wear and core-rot is lubrication with *Texaco Crater*.

Texaco Crater penetrates to the very core of wire rope, sealing each wire in a tough, viscous film that reduces internal friction, keeps out moisture, prevents corrosion, *keeps rope stronger longer.*

Used on open gears, *Texaco Crater* cushions load shocks, stops undue wear, quiets the noise. It doesn't ball up, channel or throw off, but clings to tooth surfaces, following through from gear to gear, despite heavy pressures, high temperatures and peripheral speeds.

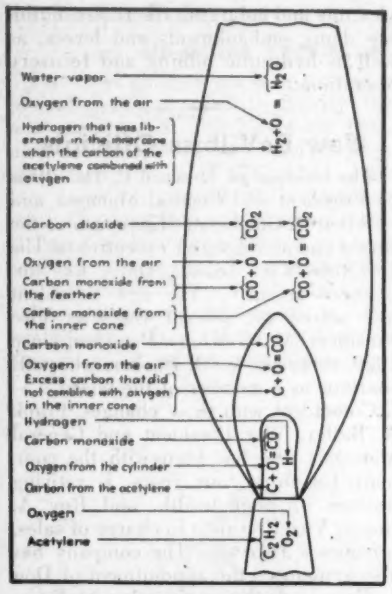
Texaco lubricants have proved so effective in service that they are definitely preferred in many fields.

Texaco Lubrication Engineering Service is available to you through more than 2300 Texaco distributing points in the 48 States. The Texas Company, 135 East 42nd Street, New York 17, N. Y.

FREE! 36-page booklet explains new low-cost protection against rust. Tells how to make equipment last years longer. Write for your copy.

TEXACO CRATER

TUNE IN THE TEXACO STAR THEATRE EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY


Water vapor
Oxygen from the air
Hydrogen that was liberated in the inner cone when the carbon of the acetylene combined with oxygen
Carbon dioxide
Oxygen from the air
Carbon monoxide from the feather
Carbon monoxide from the inner cone
Carbon monoxide
Oxygen from the air
Excess carbon that did not combine with oxygen in the inner cone
Hydrogen
Carbon monoxide
Oxygen from the cylinder
Carbon from the acetylene
Oxygen
Acetylene

This sketch shows graphically what takes place during combustion in each of the three zones of an excess-acetylene flame.

Improving Results In Flame Welding

Fundamental Principles Governing Oxy-Acetylene Welding and the Correct Adjustment of the Flame

✦ ONE of the main reasons for the versatility of the oxy-acetylene flame is the wide range of characteristics that it can be given and the consequent variety of effects that it can have on the chemical and metallurgical characteristics of the molten weld metal. To take full advantage of the adjustability of the flame, the modern welding blowpipe is designed so that the operator can accurately control its characteristics and adjust them to suit the particular requirements of each of the many different kinds of metals in commercial use.

The operator must know how to recognize and obtain the three fundamental types of flame adjustment and their many variations. In addition, he should understand the basic chemistry of the oxy-acetylene flame, the chemical properties of the different adjustments, and the ways that these affect the weld metal. With this knowledge as a background, experience will quickly teach him how to recognize or determine the flame requirements of any particular welding job.

Adjusting the Blowpipe

There are three general types of flame adjustment, neutral, excess-acetylene, and excess-oxygen. Since the amount of the "excess" may vary greatly, there are numerous variations of the latter two types.

The operator will find the study of flame adjustment clearer if he first actually lights a welding blowpipe, then changes the proportions of oxygen and acetylene in the flame, observes the flame characteristics, and identifies the different types of adjustment. When doing this, he should use a clean tip because a clogged or dirty one will distort the flame and make identification difficult. The blowpipe should, of course, be lighted according to the manufacturer's recommendations.

When the blowpipe is lighted with the acetylene valve wide open and the oxygen valve just slightly open, the flame is a smoky yellow and gives off quantities of fine black soot. This is the type of flame that results from incomplete burning of the acetylene. As the blowpipe oxygen valve is opened further, more oxygen is mixed with the acetylene. The flame turns from yellow to blue and assumes three distinct parts, a brilliant white inner cone, a secondary cone or feather surrounding the inner cone, and a bluish, faintly luminous outer envelope. These are the general characteristics of the excess-acetylene flame.

The operator should continue to open the blowpipe oxygen valve slowly until it is wide open. With most blowpipes, there is still slightly more acetylene than oxygen in the mixture being burned when the blowpipe acetylene and oxygen valves are both wide open and the correct pressures are being used. Now the blowpipe acetylene valve should be closed very slowly and the changing flame observed. The secondary cone or feather gets gradually smaller and smaller until its disappears entirely. Just at this point of complete disappearance, the neutral flame is formed. There is no excess of either acetylene or oxygen. The two remaining zones, inner cone and outer envelope, are sharply defined. The brilliant white inner cone is from $\frac{1}{16}$ to 1 inch long, depending upon the size of the tip used. Surrounding this is the larger outer envelope, only faintly luminous and delicately blue in color.

When the blowpipe acetylene valve is closed still further, the flame is given an excess of oxygen. A change in the appearance of the flame can be noticed, although it is not so great as the change from the excess-acetylene flame to the neutral flame. The whole flame is smaller, and, like the neutral flame, consists of two zones, the inner cone and the outer envelope. The inner cone is shorter and less sharply defined and has a purplish tinge; sometimes it is "necked in" on the sides. These are the characteristics of the excess-oxygen flame.

The Neutral Flame

The neutral flame is the most important for the operator to know with certainty because it is used as the basis of reference in establishing the other types and also because it is used for so many different welding and cutting operations. The neutral flame is said to exist when equal proportions of oxygen and acetylene are being supplied from the blowpipe. It is called "neutral" because it has a neutral chemical effect on the weld metal when it is held in the proper manner with the inner cone not quite touching the molten metal.

Because of the close similarity in the

(*Continued on page* 84)

Ring-Free removes carbon. Keeps pistons clean, rings free. Reduces power loss.

Ring-Free's high film strength and long cling make bearings last longer, even under overloads.

Ring-Free holds foreign particles in suspension... stops sludge formation, reduces port clogging.

You'll move more tons of material per gallon of fuel consumed if you use Macmillan Ring-Free Motor Oil. That is a simple statement of fact, and the reasons are very easy to explain.

It takes *power* to move material. It also takes power to *overcome internal engine friction.* The more internal friction is reduced, the more power you'll have for hauling material, or other productive work.

Ring-Free Motor Oil cuts friction-power-loss materially, because it *reduces friction fast.* It lubricates better because it removes carbon, has high film strength, long cling and thorough penetration.

*TESTED AND PROVED ON THE JOB

Operators everywhere find their engines run better and last longer when lubricated with Ring-Free. Power is increased, shut-downs and repairs are decreased. Operating and maintenance costs go down, production and profits go up.

You, too, will notice *immediate improvement* when you change to Ring-Free. Give it the hardest tests you can, on your toughest jobs. It will effectively answer many of your difficulties.

"For the past seven years I have been using Ring-Free Motor Oil in my fleet. I get from seventy to eighty thousand miles before changing motors or being forced to make any major repairs. I never have any sticky valves and but slight traces of carbon, and my gasoline mileage has increased more than ten per cent."

Henry J. Schafer, Jr., Pres.
Schafer Brothers Trucking Corp.

MACMILLAN RING-FREE MOTOR OIL

MACMILLAN PETROLEUM CORPORATION

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For 68 Years Builders of Fine WHEEL BARROWS:
AMERICAN
STEEL SCRAPER CO.
Sidney, Ohio
Watch for Post-War Models

Air Mapping Helps In Highway Location

(*Continued from page 47*)

proposed highway location. Following the general direction set up on the index map, mark out all possible locations, going from picture to picture, and flight to flight as the topography dictates. Transfer the most logical locations to the mosaic. When viewing through the stereoscope, it is not possible to determine the grades, but, with experience, the locater can approximate the grade within about 3 per cent. Occasionally it will be doubtful, in which case it is necessary to field-check the line with an aneroid barometer or an Abney hand level.

After the project is staked out, the center line is sketched on photographs by inspection. The drainage areas for the various culverts are traced out through the stereoscope, and are then transferred to tracing paper or cloth and the areas determined with a planimeter. In the case of large culverts or streams, where the drainage area covers several photographs, it is more satisfactory and accurate to transfer these areas to the mosaic by inspection. Then place the paper on the mosaic and trace the area. This eliminates any errors due to distortion and simplifies measuring the area with a planimeter by eliminating the necessary match marks on each photograph.

Tracing Contours

The multiplex projector is one method of making maps from aerial photographs. Diapositives of the aerial photographs are placed in the projectors. These projectors are then set to reproduce all conditions at the time the exposure was made, correcting for tilt. Lamps with filters of complementary colors are placed in alternate projectors. These filters are usually red and green. The intersection of these rays forms a picture which, when viewed through glasses having the same filters as the projector, produces an exact model of the terrain.

At the center of the tracing stand is a small pin point of light. This light will appear to be floating in space or buried in the ground. By moving the stand back and forth, it is possible to determine the point where the spot lies on the ground surface. By moving the stand so that the spot remains on the surface, it is possible to trace out a contour. This stand is calibrated, so that from previous ground control, contours of any desired interval can be traced. General practice is to use contour intervals of 10 feet in flat country, 20 feet in rolling, and 40 feet in mountainous regions. The accuracy of these contours with present-day equipment is about one-half the contour interval.

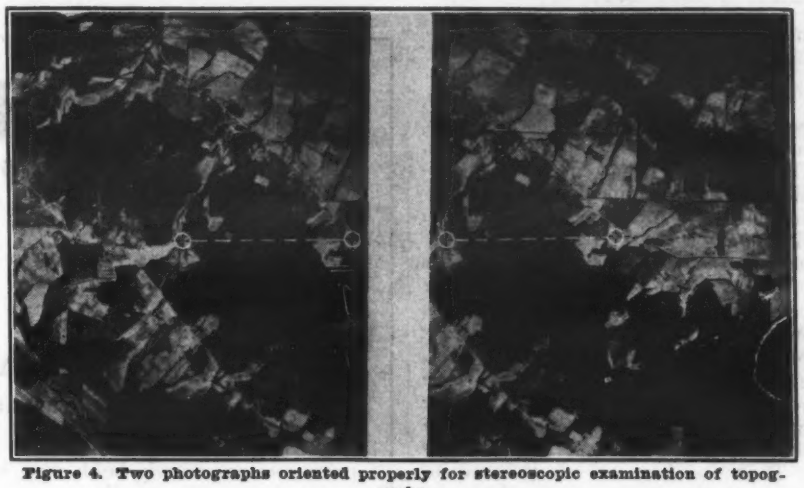


Figure 4. Two photographs oriented properly for stereoscopic examination of topography.

Elaborate equipment of this type is very expensive, and requires trained operators and special devices to control temperature and humidity in the drafting room at all times. Experienced personnel is required to set up the projectors. It is a very specialized profession, to which one has to devote his entire time to keep up with the changes in methods and equipment.

Other Uses of Aerial Photos

Aerial photographs may also be used in connection with traffic-control studies. Analyses of pictures taken during periods of congestion may suggest possible solutions. The photograph will indicate the density of traffic and also the general trends of traffic movement. There is really no limit to the advantageous use that can be made of aerial photographs, not only on highway work but on municipal, recreational, and drainage projects involving problems that highway engineers are frequently called upon to solve.

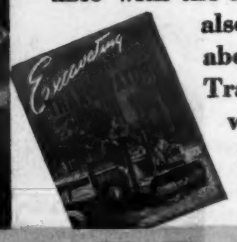
The use of aerial equipment is a field that has great possibilities. The development of the helicopter seems the next step which holds out great promise for highway location through aerial photography.

From a paper presented before the annual Highway Conference held at the University of Tennessee, Knoxville, Tenn., May 12-13, 1944.

Loading Gravel from Stock Pile

Basement Excavation

Road Widening



MASTER OF ALL JOBS

TRAXCAVATORS are the world's most versatile earth and material moving machines. In addition to digging and loading, they ditch, cast, carry, spread, backfill, level, and do a host of other tasks. Highly mobile, TRAXCAVATORS travel around jobs under their own power at speeds up to six miles per hour . . . can readily be transported on streets and highways. Powered by "Caterpillar" track-type tractors, with bucket capacities from ½ to 2½ cubic yards. Bulldozer blade, quickly interchangeable with the bucket, and other attachments also available. Get the facts now, about TRAXCAVATORS from your Trackson-"Caterpillar" dealer or write for informative booklet to TRACKSON COMPANY, Milwaukee 1, Wisconsin.

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The Original Tractor Excavator

PILE HAMMERS and EXTRACTORS

HOISTS—DERRICKS WHIRLERS

Special Equipment
Movable Bridge Machinery

Write for descriptive catalogs.

McKIERNAN-TERRY CORP.
19 Park Row, New York

Distributors in Principal Cities

West Virginia Plans For Roads and Jobs

(*Continued from page 50*)

space is extremely limited, and land values are much greater than in towns of similar size in less rugged country. Therefore, old streets and sidewalks are narrow; alleys are few or non-existent; business properties are concentrated on the logical travel routes; and railroads often occupy the space along the streams. These conditions have created a problem with which it has been hard to cope. Included in our post-war program are a number of projects to skirt such municipalities with major highways. The design will be such as to permit through traffic to by-pass the congested areas, and at the same time to provide for ready entry into and exit from the business sections over different streets or lateral roads.

Providing Employment

In mapping out our post-war program, we have borne in mind one of the prime objectives of increased public construction, namely to afford employment on urgently needed improvements in localities where unemployment will most likely require it. For this reason we have spread our projects over the state roughly in proportion to population densities, and have included important improvements to a number of secondary roads.

In addition to this construction program, which may be financed in part by the Federal government, we anticipate a large amount of work of a type, mentioned earlier in this article as reconstruction or super-maintenance, which will require very little engineering and which is not included in our formal program. The volume of this work and the regular maintenance work of patching, sealing and light surface treatments will be limited only by the revenues available, and will further extend employment opportunities to every section of the state.

Financing the Program

The expenditures which would be required to bring the 33,000 miles of West Virginia highways up to desired standards so far transcend the amount of money which can reasonably be anticipated in the post-war period that we can expect to make only accelerated progress toward our goal. Our Highway Planning Division devoted several years to a comprehensive survey of our highway needs, the results of which were published in 1940 in a 155-page volume, replete with statistical data and charts, and projecting traffic changes, finances, road life expectancy, physical developments, and improvements over the 20-year period 1940-60. The projected requirements to 1960 on the 4,800 miles of primary highways alone was $227,654,103.

We estimate that we can very profitably expend within the first few years following the war $163,489,789 on the improvement of our highway system, both primary and secondary. But contrast this with the funds that may materialize. Under the terms of the $1,500,000,000 highway bill before Congress, West Virginia, over a three-year period, would be entitled to approximately $18,000,000. As the bill is now drawn, the matching basis is 60 per cent Federal and 40 per cent state the first year, and 50-50 for the next two years. This would mean that West Virginia would have a total of $10,000,000 for the first year, and $12,000,000 for each of the following years, or a three-year total of $34,000,000. Costs of rights-of-way would come from this, thereby reducing the amount available for construction purposes to something like $28,000,000. This would be about one and one-third of our normal pre-war volume of contract construction.

Personnel Problem

As to progress on surveys and plans, we have, like other states, been severely handicapped by the shortage of men. On July 1, 1941, our construction division had 256 men, including survey parties, inspectors, draftsmen and designers. At present it has 147, a loss of 45 per cent. On surveys, the loss has been 8 per cent and in the drafting room, 31 per cent. But this does not tell the whole story. The turnover has been rapid; replacements have often been inferior or, even if competent, have required time for training in our particular work. We have thus lost in efficiency as well as in numbers.

There has been no effective way to cope with this situation. Our salaries, as compared to those paid by war industries, are too low to attract men and there is no way we can raise them sufficiently to compete. We have tried to sign up men before they left college and have

(*Concluded on next page*)

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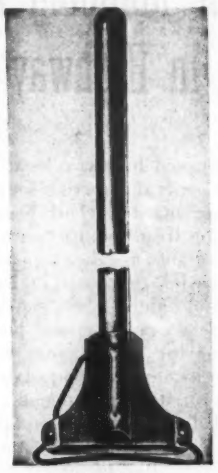
No screws or clamps to tangle mops or injure furniture

AVAILABLE ON PRIORITY BASIS

Will accommodate any size mop from a 16-oz. to a 36-oz. inclusive. Automatic, self-adjusting spring tension securely holds mop in place.

Write for further information concerning GEERPRES Mopping Equipment

GEERPRES WRINGER Inc. MUSKEGON 51 MICHIGAN



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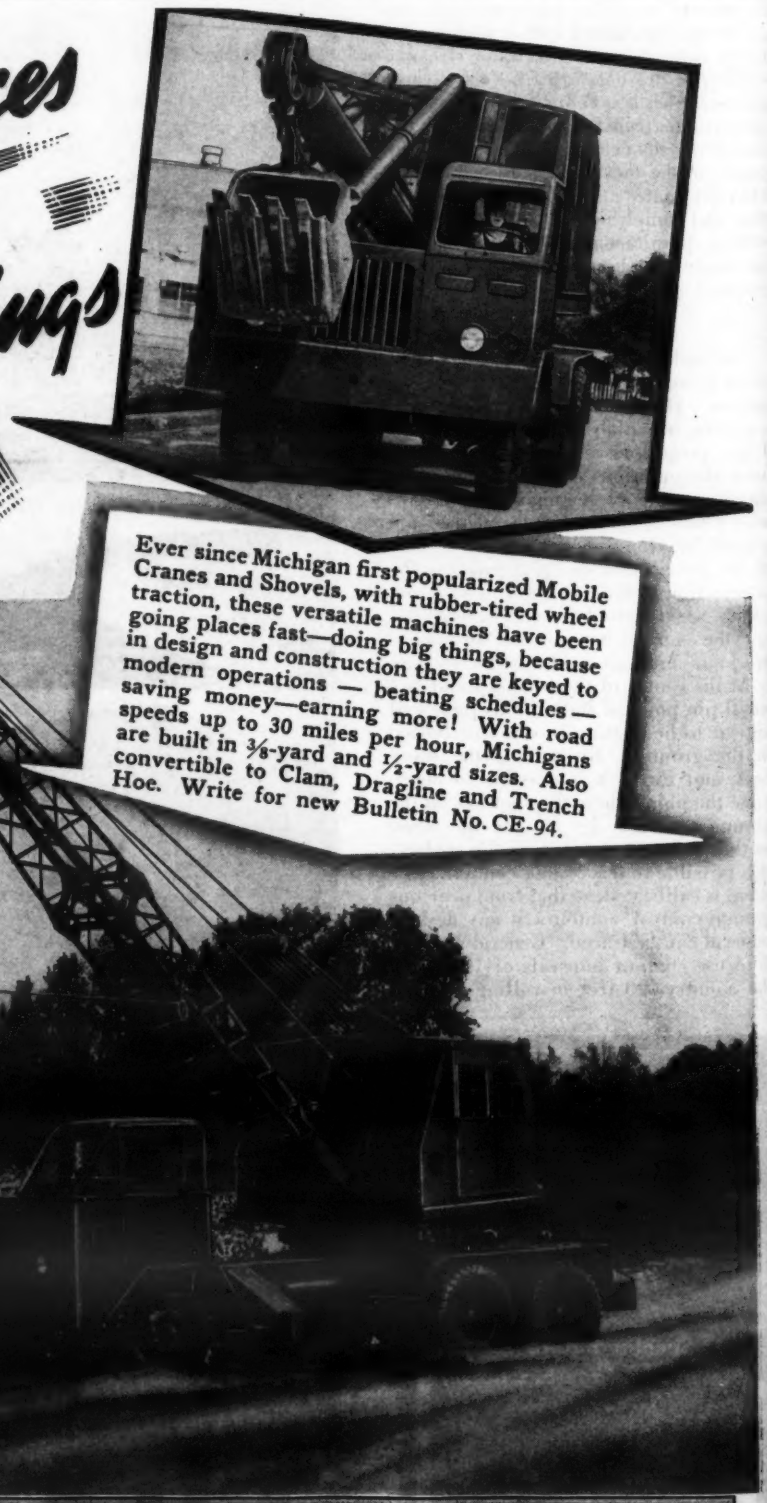
Long Life
Nothing to Wear Out

Going Places to do BIG things



Ever since Michigan first popularized Mobile Cranes and Shovels, with rubber-tired wheel traction, these versatile machines have been going places fast—doing big things, because in design and construction they are keyed to modern operations — beating schedules — saving money—earning more! With road speeds up to 30 miles per hour, Michigans are built in ⅜-yard and ½-yard sizes. Also convertible to Clam, Dragline and Trench Hoe. Write for new Bulletin No. CE-94.

MICHIGAN
POWER SHOVEL COMPANY
BENTON HARBOR, MICHIGAN

Future Highway Work To Be Done in W. Va.

(Continued from preceding page)

combed the woods for older men, with little success. We succeeded in securing a few women draftsmen, but these too are scarce and, like men, seek jobs with the highest salaries. We have only two left.

We have transferred to the drafting rooms any men on inspection or maintenance work who are capable of road or bridge design and willing to make the change. We have tried working draftsmen extra hours with overtime pay, for the two-fold purpose of increasing the volume of work produced and of adding to their pay checks. This has met with indifferent success but we have not abandoned the idea. We propose to contract to consulting engineers some of our bridge-structure designs.

Status of Plans

Despite our difficulties in securing sufficient engineers, we are in rather favorable shape to start promptly and carry forward effectively our post-war construction. This is due in part to the large volume of completed and partially completed plans on hand at the outbreak of war, and partly to the slow but steady progress we have made since that date. We are now in a position to advertise projects of an estimated value of $7,700,000, and could continue lettings for the balance of the year to bring the total volume up to $25,000,000.

Predictions beyond this point are difficult to make and of little practical value. Should the war end by January 1, 1945, and the post-war highway program be activated, then it is presumed that many engineers would be available, and the preparation of plans would be greatly accelerated. If it does not end, it is probable that the shortage of personnel will remain critical and progress will be slow. The main problem is to have a reservoir of surveys and plans sufficient to take care of the first impact. By the end of this year, we expect to have plans ready to take care of nearly two years of the construction program that would be provided by the pending post-war highway act.

Right-of-Way Acquisition

As to rights-of-way, it is the policy in West Virginia to attempt to negotiate a mutually satisfactory settlement with the property owner. However, the state law confers upon the State Road Commissioner or the State Road Commission the right of eminent domain. If necessary, right of entry may be secured immediately upon filing the petition. Therefore, delay in acquiring rights-of-way is not a serious problem with us, and will not be a factor in our ability to start promptly any work authorized under the post-war highway construction program.

Tire Heat Reduced By a New Wider Rim

It has become almost trite to say that it is vitally important to increase truck-tire life. However, manufacturers of truck tires are studying every means of lengthening the life of both natural-rubber and synthetic-rubber tires. The Goodyear Tire & Rubber Co., Akron, Ohio, recently announced the development of a new wide-base rim, combining all the features of the present standard-rim base with a new side ring that adds stability to the tire, reducing sway and giving a more positive steering response as well as reducing the heat generated in the tire.

The rubber industry recently determined that the width of the rim should be approximately 70 per cent of the sectional diameter of the tire if maximum performance is to be obtained. Lesser rim width "pinches" the tire and causes excessive flex in the side walls which generates heat. Tires mounted on the wide rims do not generate as much heat in the shoulder of the tire as do tires mounted on narrow rims and the average amount of deflection under load and in motion is reduced 12.5 per cent when the ratio of rim width to that of the tire sectional diameter is increased from 60 to 70 per cent.

An additional feature of the new Goodyear rim is the tapered "seat" under both beads. This centers the beads and decreases chafing and bead failure. Present users of Goodyear rims can obtain an increase in their rim-base width merely by obtaining new side rings, as the old and new side rings are completely interchangeable.

Complete information on the new wide-base rim may be secured by those interested direct from Goodyear by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Don't Mow Milkweed On Your Roadsides

The needs of war have reached down to every roadside in the twenty-eight of our forty-eight states where milkweed grows. State, county, and township highway departments should instruct their maintenance patrolmen not to mow areas along the highway rights-of-way where milkweed growth is concentrated.

The War Production Board has requested the Commodity Credit Corporation of the War Food Administration to collect at least 1,500,000 pounds of milkweed floss in 1944 to meet urgent war needs. This material is a substitute for kapok, formerly imported from the Dutch East Indies and essential as buoyant material in life jackets. Time does not permit developing the plant as a crop and the needs must be obtained from wild plants; hence the urgent appeal, not to cut down milkweed this year until after the milkweed-pod production program of the Commodity Credit Corporation has been initiated through Federal and state agricultural agencies, 4-H Clubs, Boy Scouts, Girl Scouts, Red Cross groups and others. The pods mature early in September; therefore, collection activities should not interfere with mowing operations before snowfall to remove wind barriers which would otherwise cause snow drifts along highways.

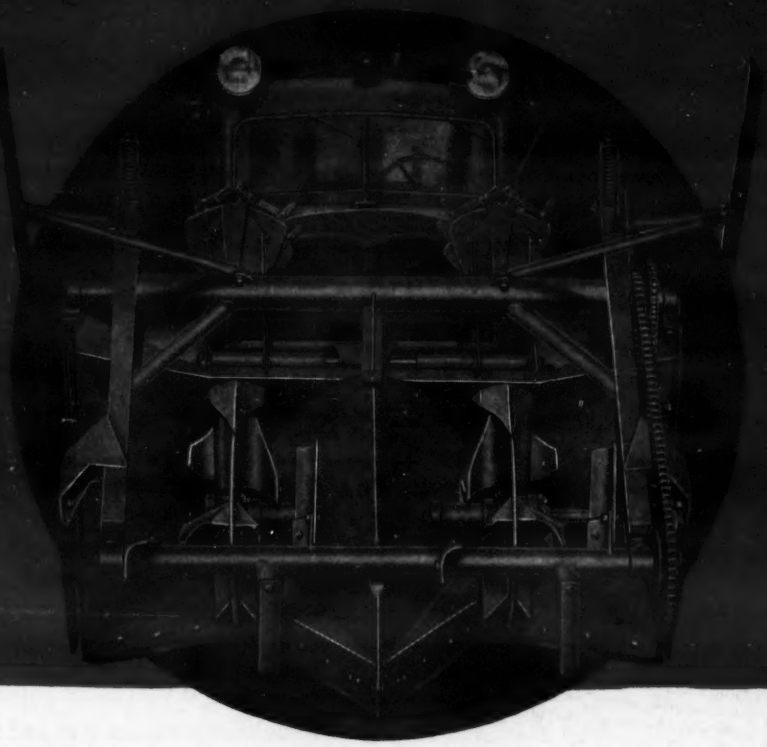
Highway rights-of-way in the twenty-eight states listed below constitute one of the large areas of potential milkweed-pod production. The extensive collection program will be carried out in:

Arkansas
Connecticut
Delaware
Illinois
Indiana
Iowa
Kansas
Kentucky
Maine
Maryland
Massachusetts
Michigan
Minnesota
Missouri
Nebraska
New Hampshire
New Jersey
New York
North Dakota
Oklahoma
Ohio
Pennsylvania
Rhode Island
South Dakota
Vermont
Virginia
West Virginia
Wisconsin

Gasoline and oil power the attack and are essential to winning the war. Use yours wisely; don't waste them!

BROS Rotary SNOW PLOW

establishes new records in SNOW REMOVAL!



Read This Statement Slowly—A Bros Rotary Snow Plow was put to work on a stretch of road blocked by drifts 12 to 14 feet high. These drifts were so firmly packed that snow plows could travel on them, and because of successive drifting, thawing and freezing, these drifts also contained several layers of blue ice, six to eight inches thick. This was the operating condition—one of the toughest ever faced—and the Bros Rotary Snow Plow cleaned that road down to the concrete.

The Bros Rotary Plow does its jobs as easily and smoothly as a reaper cutting grain. The plow is not plunged into the drifts but moves ahead at a constant pace, because, *as it moves, the revolving rake chews up the snow and ice* and feeds them to the powerful rotors, which discharge the load far to either side of the road.

Because plunging and bucking are eliminated, the Bros Rotary reduces truck maintenance and fuel consumption as much as 75%. There are no shocks or strains. All operations are hydraulically controlled from the cab. The plow may be removed from truck in less than one hour making it available for other classes of work.

Write for complete specifications, illustrations and other data. Get the details on the Bros Rotary—the plow that can do any snow job anywhere, faster and at lower cost.

WM. BROS BOILER & MFG. CO. MINNEAPOLIS, MINN.

DISTRIBUTORS IN ALL PRINCIPAL CITIES

New Reinforcing Bars Described in Folder

Hi-Bond reinforcing bars for concrete construction, the new development in concrete reinforcing steel recently announced by the Inland Steel Co., 38 So. Dearborn St., Chicago 3, Ill., are described in a new folder. These bars are made to nine standard areas, ranging from 0.11 to 1.56 square inches, approved by the National Bureau of Standards Division of Simplified Practice, Recommendation R 26-42.

Copies of this folder may be secured by interested contractors and engineers direct from the manufacturer by referring to this item.

Oxychloride Cement Association Formed

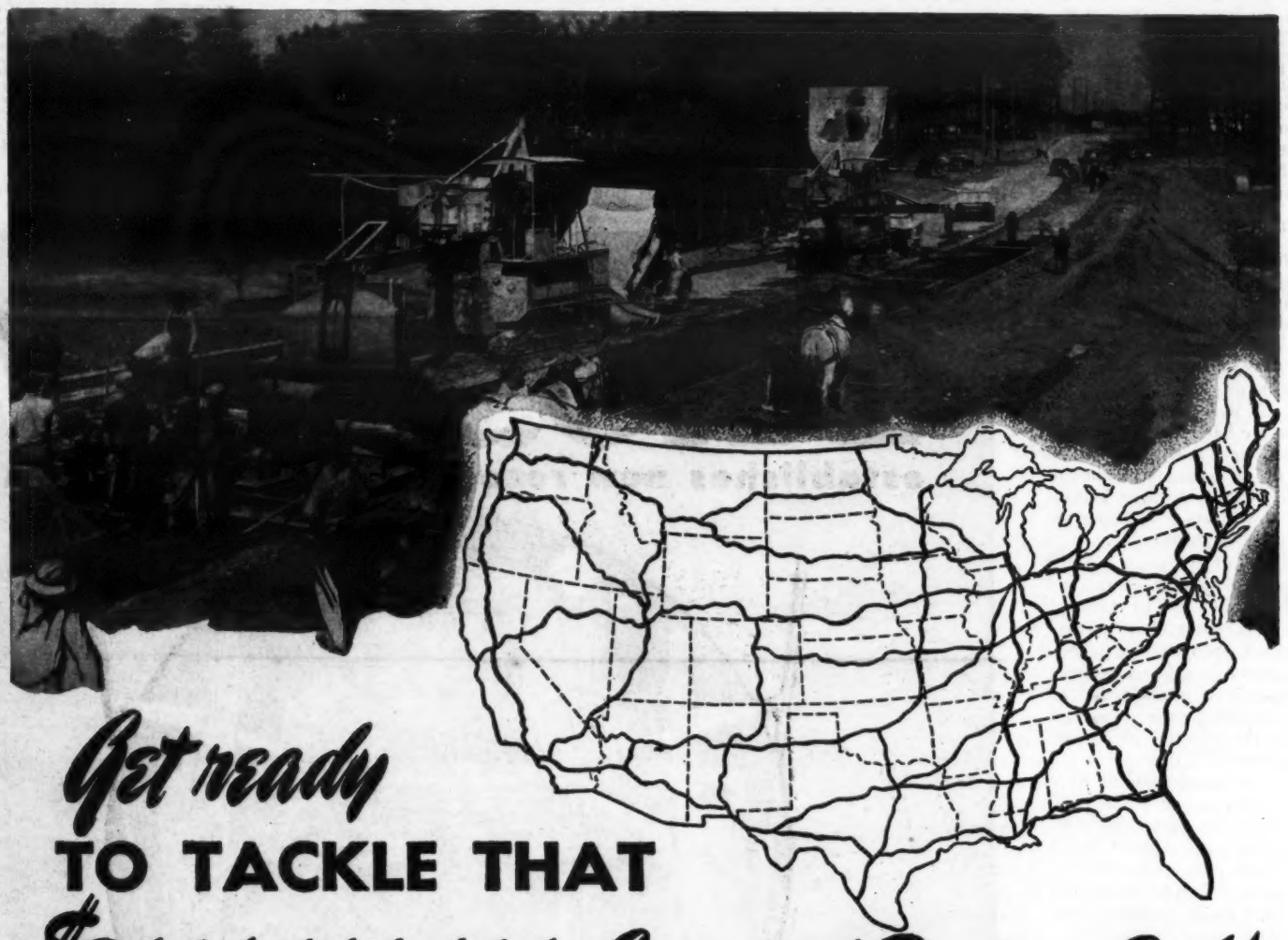
The formation of the Oxychloride Cement Association, a non-profit organization to render service in standardizing performance tests and application specifications for the use of Oxychloride cement, has been announced, with a membership including the Dow Chemical Co., Midland, Mich.; F. E. Schundler & Co., Inc., Joliet, Ill.; and Westvaco Chlorine Products Corp., New York, N. Y.

The Association has stated that its primary aim is to provide an impartial coordinating body as a practical means of aiding governmental agencies, industry, architects, engineers, and contractors to obtain the best possible results in the use of Oxychloride cements. It will act as a clearing house in the formulation of performance tests and standard specifications, will disseminate available knowledge of various types of Oxychloride-cement mixtures in diverse applications, and correlate data on new uses and methods of application.

The Association's main office is located at 1010 Vermont Ave., N. W., Washington 5, D. C. C. Huddleston Bear is Secretary.

Guard Rail Available

Announcement has been made by the Tuthill Spring Co., Chicago, Ill., that Tuthill highway guard rail, which for some time has been unavailable because of the steel shortage, is once more obtainable for highway use. Full details on this guard rail and its use, not only along the highways but also as a centerline barrier on divided highways, may be secured from the company, located at 762 Polk St., Chicago 7, Ill.



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TO TACKLE THAT
$3,000,000,000 Annual Paving Job!

Only Multi Foote Pavers Give You All These Features

DOUBLE CONE DRUM with its end-to-end scouring action insures a complete and thorough mix of every batch.

TROUBLE-FREE WATER SYSTEM is simple, accurate and independent of water pressure.

HIGH OPERATING PLATFORM assures greater visibility and faster, more accurate work.

ROTARY DISCHARGE takes only a quarter turn to kick concrete into the big bucket ready to speed out the long boom to be discharged.

BIG, WIDE, SOLID SKIP prevents spilling and assures fast, positive charging.

SIMPLE, RUGGED DRIVE provides fast, smooth action.

Three billion dollars worth of paving jobs will be awarded annually to the lowest bidding contractors. You can be certain to get your share if you have Multi Foote Pavers like those that have given such impressive performance on war front construction. Their records for speed and low cost are the reasons why there are more Multi Foote Pavers in service than any other make.

Big capacity for big jobs, yet profitable to use on smaller ones too. Simple, easy operation and maintenance, speed and dependability second to none, proved superior design — these are only a few of the reasons for Multi Foote leadership. Write today for details.

THE FOOTE COMPANY, INC.

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Multi Foote Pavers Conform to A. G. C. Standards and Specifications.

The World's Largest Exclusive Manufacturers of Concrete and Black Top Pavers.

ARMY (E) NAVY

MULTI FOOTE
CONCRETE PAVERS

ADNUN BLACK TOP PAVER

The new improved Duraweld goggle is designed to provide better protection and greater comfort for welders' eyes.

Better Protection In Welders' Goggles

A new welding goggle which provides better protection and greater comfort for welders' eyes has been announced by American Optical Co., Southbridge, Mass. This AO Duraweld goggle has newly designed eyecups, anatomically molded for the right and left eye, with larger, more comfortable edges, rounded to fit flush against the contour of the face. The eyecups are also shallow but with deep sides, constituting the best balance obtainable between proper height for wider vision and adequate protection. Improved nasal fitting also adds to comfort and safety.

Side shields are of entirely new design, providing increased ventilation to keep the eyes cool and to prevent the fogging of lenses. The new style louvers are so designed that it is impossible for stray light rays or sparks to reach the eyes.

An easily adjusted, non-slip one-piece headband is provided which resists perspiration, oil, water, and grease. The ball-chain bridge, covered with curved plastic tubing, fits snugly over the bridge of the nose, and can be quickly and easily adjusted.

As standard equipment, the new, improved AO 404A Duraweld goggles are fitted with Noviweld lenses in 3, 4, 5, 6, or 8 shades. Optional equipment includes Filterweld lenses in 3, 4, 5, 6, 7 or 8 shades; Noviweld-Didymium lenses, for absorbing yellow sodium flare, in shades 3, 4, 5 or 6; or Super Armorplate Calobar lenses of medium, dark or extra-dark shades which are designed for persons working near welding operations.

Complete information and prices of this new welding goggle may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Production of Structural Steel Remains Under 1943

June, 1944, bookings of fabricated structural steel for bridge and building construction, as reported to the American Institute of Steel Construction by companies representing 77.8 per cent of the total average of the industry during the years 1923-25, amounted to 58,982 tons. Bookings for June, 1943, were 79,409 tons.

June shipments for bridge and building construction totaled 33,046 tons as compared with 68,352 tons, reported in the same month last year. The reported tonnage available for fabrication within the four-month period of July to October was 122,661 tons.

Haynes Stellite Co. Elects E. E. LeVan as President

Announcement has been made by the Haynes Stellite Co., a unit of Union Carbide & Carbon Corp., of the election of E. E. LeVan as President, to succeed the late Francis P. Gormely. Mr. LeVan has been associated with the company since 1922, when he joined it as a sales engineer. Three years later, he was made Chief Engineer, in 1929 he became General Sales Manager, was elected Vice President in 1939, and on May 22, 1944, was made Vice President and General Manager.

Mr. LeVan will continue to make his headquarters at Kokomo, Ind., where the general offices and plant of the Haynes Stellite Co. are located.

Folder on Car Pullers

Jeffrey all-purpose car pullers for spotting aggregate and cement cars at concrete and asphalt batching plants or for similar moving jobs are described and illustrated in a 4-page bulletin issued by the Jeffrey Mfg. Co., 970-99 No. 4th St., Columbus 16, Ohio. One-man-operated, these car pullers have a large vertical capstan which permits pulling in any direction, and their compact design allows for installation in a small space. All working parts are enclosed in a heavy case, the motor is weatherproof and protected against overload, and operation is controlled by a weatherproof push button.

Copies of this Bulletin 774 on Jeffrey car pullers, which are available in two sizes, may be secured by those interested direct from the manufacturer by referring to this item.

WINPOWER

"DIESEL" ELECTRIC PLANT

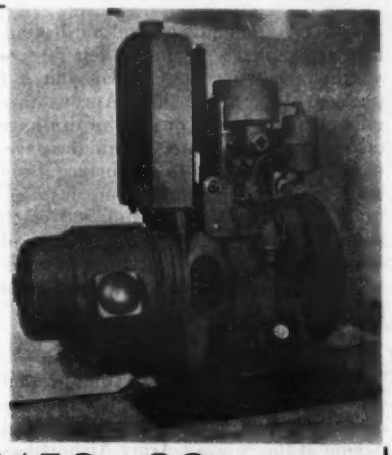
Designed to do the Job

Model D1-3A

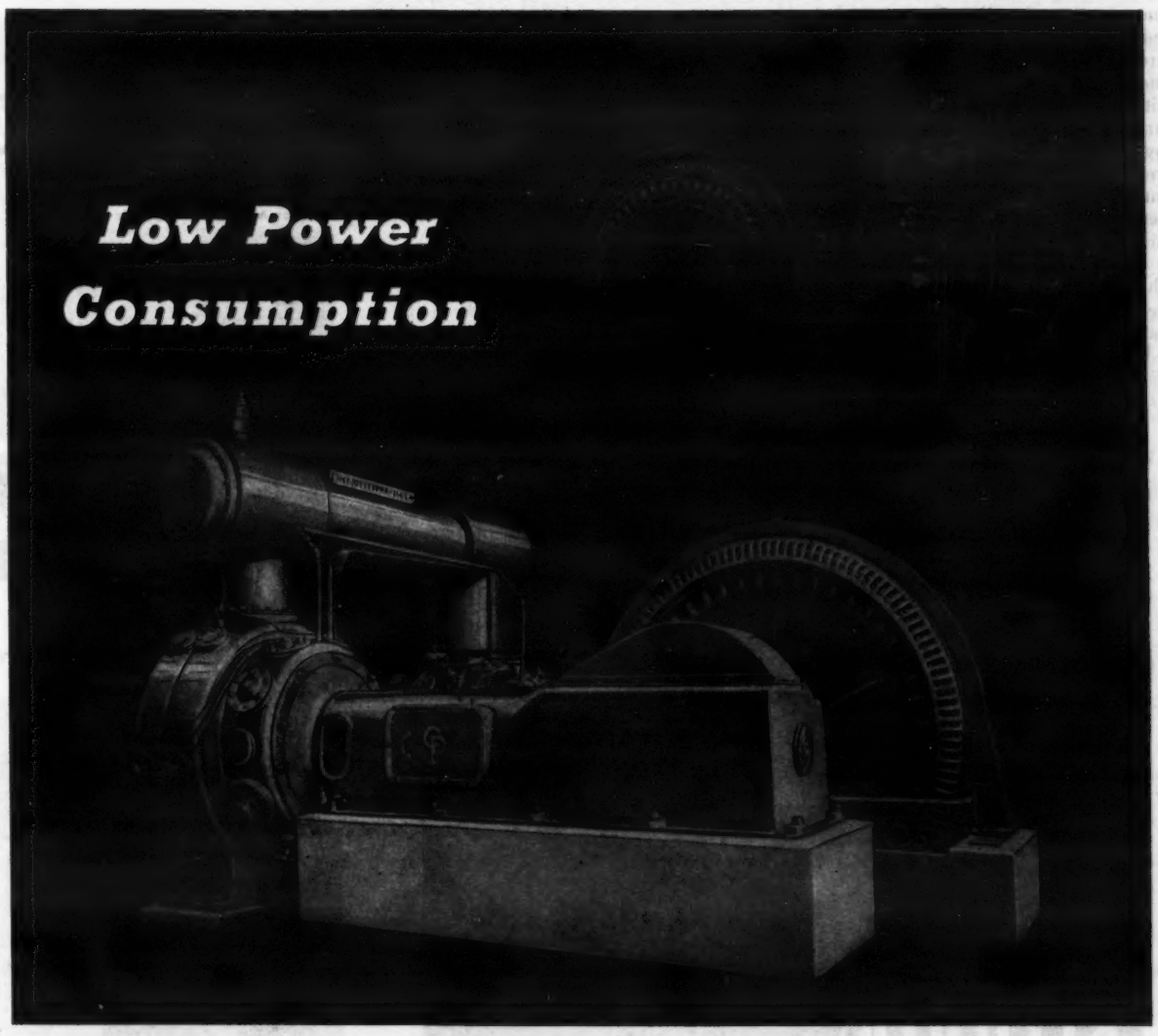
3000 Watts, 110 Volts, A.C.

An extremely compact, durably built small diesel electric plant combining the economy of a diesel engine together with an initial low purchase price. Enables the smaller power user to share in the sensational savings possible with safe, economical Diesel power.

Send for catalog giving specifications



WIND POWER MFG. CO. Newton, Iowa



BUILT INTO CP CLASS O-CE COMPRESSOR

THE low power consumption of the heavy-duty Chicago Pneumatic Class O-CE Compressor is the result of large area, durable, quick-acting Simplate valves . . . streamlined air passages . . . multi-step capacity regulation . . . thoroughly effective intercooling and water jacketing and efficient lubrication.

CP Class O-CE Compressor is of the horizontal, double-acting, water-cooled type with direct-mounted synchronous motor drive. Capacities range from 350 c.f.m. to 10,000 c.f.m., 80 pounds to 125 pounds pressure. Other sizes available for lower and higher pressures and for other types of drive. Write for Bulletin 726.

PNEUMATIC TOOLS
ELECTRIC TOOLS
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CHICAGO PNEUMATIC TOOL COMPANY

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AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

Newark Airport

(*Continued from page 15*)

size pipes. The taxiways and hard-standings are similarly drained, their 50-foot width having a center crown with a 1 per cent slope to the sides. Aprons have either side drainage, or interior drainage consisting of drop inlets within the pavement to carry water to subsurface drain lines. Included in this elaborate drainage plan are 179 manholes and 500 catch basins or drop inlets. Many feet of existing pipe had to be removed or relocated to fit in with the expansion program.

New Paving Designs Used

Since the beginning of the present war construction program, new theories of paving design have been used, and paving at the Newark Army Airport has been built from such designs. Stresses due to landing impact are now ignored, since it is generally believed that the buoyancy or wing lift of moving planes reduces these stresses. The highest stresses occur on the warming-up aprons due to dead weight and vibration when, with plane wheels locked, the motors are turned over at high speeds. The warming-up aprons are built of 8-inch concrete, while the runways are of heavy-duty asphalt. Seven warm-up aprons were included in this contract. Each of the three runways has two aprons, one at each end, measuring 300 x 150 feet, while the seventh and largest, 600 x 200 feet, is located in front of the administration building adjacent to the hangars.

In keeping with design policy of conserving critical material, no steel reinforcing was used in the concrete pavements except for 1-inch round dowels spaced 2 feet 6 inches on centers, and 2 feet 6 inches long. Truck-mixed concrete was also used in this paving, alternate strips of 12 feet 6 inches in width being poured longitudinally. An expansion joint of premolded bituminous joint filler extends down the middle of each apron.

Runways, taxiways and hard-standings have flexible pavements. The 150-foot runways have a subgrade of at least 42 inches selected borrow. On top of that is a 6-inch layer of gravel borrow. Then follows a 4-inch course of dry-bound macadam base, a 3-inch bituminous penetration-macadam base, and a 2-inch bituminous-concrete wearing course topped by an RC-2 cut-back seal coat. The runways are outlined by stripes of white-cement concrete, 18 inches wide and 6 inches thick, which clearly show fliers the limits of the paved surface. Shoulders, 175 feet in width, slope from the runways to meet the existing field. These shoulders have a 2-inch topsoil treatment and are seeded with a good cover grass. A total landing-strip width of 500 feet is thus provided in paved surface and shoulders.

Taxiways and hard-standings have 12-foot 6-inch shoulders adjoining the 50-foot pavement which is similar to that of the runways except that 20 inches of selected borrow was deemed a sufficient subgrade. A new runway lighting system was installed.

Quantities and Personnel

The major quantities involved in the extension program of these mile-long runways at the Newark Airport were as follows:

Item	Quantity
Excavation	425,000 cu. yds.
Excavation, trench	60,000 cu. yds.
Gravel borrow	200,000 cu. yds.
Selected borrow	1,350,000 cu. yds.
Ship ballast	80,000 cu. yds.
8-inch vitrified-clay pipe	23,000 lin. ft.
12-inch R.C.C. pipe	12,500 lin. ft.
15-inch R.C.C. pipe	1,400 lin. ft.
18-inch R.C.C. pipe	2,400 lin. ft.
24-inch R.C.C. pipe	3,700 lin. ft.
30-inch R.C.C. pipe	750 lin. ft.
36-inch R.C.C. pipe	3,400 lin. ft.
42-inch R.C.C. pipe	120 lin. ft.
48-inch R.C.C. pipe	2,200 lin. ft.
Concrete pavement for warm-up aprons	43,350 sq. yds.
Flexible pavement	462,000 sq. yds.
Runway marker strip	5,600 sq. yds.
Topsoil and seeding	170 acres
Paved gutters	2,250 sq. yds.
Treated sheet piling	14,000 sq. ft.
Treated-timber piling	332,000 lin. ft.
Runway lighting cable	23,500 lin. ft.
Reinforced concrete for culverts	9,000 cu. yds.

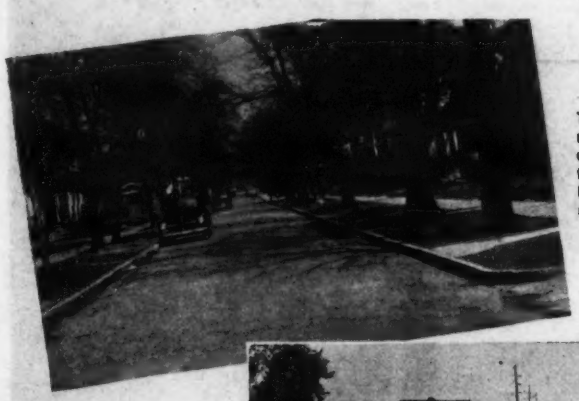
The War Department awarded the contract for the Newark Army Air Base to S. J. Groves & Sons Co. of Bogota, N.J., and Johnson, Drake & Piper, Inc., of Minneapolis, Minn., and New York City. Project personnel consisted of: Francis Thomas, Project Manager; J. B. Mathews, General Superintendent; R. L. Ellingsen, Office Manager, and Dan S. Bruck, Resident Engineer. For the Army, the work was under the supervision of the New York District Office, U. S. Engineers, Col. A. B. Jones and Col. Edgar W. Garbisch, District Engineer. Design was under the direction of Lt. Col. C. K. Panish, and Operations under the direction of Lt. Col. D. F. Fisher. Major John J. Mattiello was in charge of Field Operations.

Progress was made possible by the cooperation of the Operating Service Air Corps which coordinated their operations with the field construction program of the contractor.

The photographs used to illustrate this article were furnished through the courtesy of the New York District Office, U. S. Engineers.

Dowel-Holder Bulletins

Two bulletins describing and illustrating the Nelson dowel holder for installing joints and dowels in concrete pavement are available to interested contractors and engineers. Copies may be secured direct from the Nelson Dowel Holder Co., Lebanon, Tenn.



This BITUVIA pavement is now in its FOURTH DECADE of service. The original surface is still intact, and there has been no major maintenance expense.

This new road, built exclusively of BITUVIA, carries the heavy traffic load of a large Midwest war plant

BITUVIA Road Tar

Dependable Service for over 40 years

● **BITUVIA ROAD TAR** has stood the test of more than 40 years service on the roads and streets of America. For war-time maintenance and for peace-time construction, this time-tested material meets every requirement of safety and economy. BITUVIA is easily and quickly applied, penetrates deeply and binds the aggregate firmly, giving a resilient, skid-resistant surface. Available in all grades to meet standard specifications for all types of construction and maintenance work.

A copy of the pocket-size **BITUVIA** *Manual will be sent on request.*

REILLY TAR & CHEMICAL CORPORATION

Executive Offices: Merchants Bank Building, Indianapolis, Indiana

SEVENTEEN PLANTS TO SERVE YOU

The Bridge went UP—

Thomas A. Edison Bridge, New Jersey

but RICHMOND FORM-TY ENGINEERING

kept FORM costs down!

RICHMOND 10-WAY SAVING PLAN

1—Provides all kinds of form-tying devices to choose from.
2—Economizes because Form Ties cost less to use than wire, band or rod ties.
3—Supplies Form Ties engineered for safe working loads of 1,500-30,000 lbs.
4—Assures faster erecting and stripping plus big lumber savings.
5—Promotes perfect alignment for correct wall thickness.
6—Protects job against rust staining with 1 to 3 inch cutback.
7—Saves shipping and handling costs because of scientifically reduced weight.
8—Is only known prevention against termite destruction.
9—Enables you to borrow working parts and to pay only for ties in the job.
10—Is planned from job plans to use the right size of ties and the least number of ties to fit forming for fast, safe work.

SEE OUR CATALOG IN SWEET'S

Whether you are planning, designing or estimating on a concrete job—large or small—there are *Dollars* to be saved on *Form Work* by planning.

Richmond Services to Architects, Engineers and Contractors include recommendations on Form Tying Devices. Consultation on Form problems and Forming used, as well as Estimates on requirements, all without obligation.

The list of big jobs on which Richmond Form Ties have saved on form-work costs and speeded up completion is a blue-ribbon list of modern construction. It includes mammoth projects everywhere—and small contracts, too. There is a Richmond Tie engineered for every type of concrete construction. We plan a Tie to fit the work.

For information, write to our Planning Division.

RICHMOND SCREW ANCHOR COMPANY, INC.

216 LIBERTY AVENUE · BROOKLYN, NEW YORK

Winter Maintenance With Salt in Mass.

(Continued from page 65)

ported that within twelve hours after the heaviest snowfall, the business section is completely cleared of snow, and is without a trace of ice at the curbs to make parking difficult.

The North Adams Department of Public Works credits salt with making possible considerable savings, so that it can now keep within the $18,000 snow-removal budget.

In Town of Lennox

The town of Lennox has also been using considerable quantities of Grade CC rock salt, some mixed with a small amount of sand, for treating 46 miles under the supervision of the town selectmen. The salt treatment has proved very effective, especially in safeguarding the short but extremely steep concreted grade on U. S. 7 at the northern end of the business district. Sand mixed with a heavy concentration of rock salt is spread on the hill at the first sign of a slippery pavement, and this potentially hazardous spot is carefully watched throughout the winter. Unless the hill is promptly treated, heavy trucks as well as lighter vehicles are unable to secure traction and northbound traffic comes to a standstill at the base of the hill. Cars southbound hesitate to descend. This is one of the rare spots on New England highways where traffic coming down the hill is confined to a single lane, two lanes being assigned for ascending cars until they have passed over the crest.

State Highways

State engineers responsible for the winter maintenance of 260 miles of highways in the Berkshire region used straight salt for the first time last year on approximately 150 miles of blacktop roads. An average of ¼ pound per square yard of pavement was applied on a 2-foot-wide strip down the center of the road at the beginning of a storm, although slightly heavier concentrations were used when the temperature was low. As the rock salt dissolved and the brine undercut the snow, the bond holding the snow to the pavement was broken, and when the plows passed over these stretches, the blades were able to remove a greater amount of the snow. In a few hours, dry bare pavement was obtained.

Drifting conditions, sleet, freezing rain and high winds are often encountered in this part of the state. In the past, once ice built up in exposed or elevated locations, much sanding was required at frequent intervals to reduce the slipperiness. U. S. 7 running north and south from the Connecticut line to Vermont and the heavily traveled U. S. 20 running from the New York border through Pittsfield to the east received special attention. On both routes rock salt has been credited with safer driving conditions particularly helpful to motor freight operators. On grades and curves in the mountainous country, rock salt has forestalled ice accumulations in hitherto troublesome spots. Over 500 tons were used last winter.

Selecting Buckets For One-Drum Hoists

The problem of selecting the proper bucket to meet the operating requirements when single-drum hoists and hook-on applications are involved is one which has puzzled many operators. A new catalog No. 2002 has just been issued by Blaw-Knox Division of Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh 22, Pa., which greatly simplifies this problem, takes the guess-work out of the proper selection for any particular job, and amply classifies the different types and their uses. Each type of application is classified into the following four groups: how to select; typical method of installation; table of sizes; and typical illustrations.

Copies of this illustrated 48-page booklet may be secured direct from the manufacturer by mentioning this catalog review.

Steel-Ribbed Floor For Hauling Trailers

A new steel-ribbed floor capable of withstanding a concentrated load of 1,000 pounds per square foot, or two and one-half times more than a conventional all-wood floor of the same thickness, has been announced by the Fruehauf Trailer Co., 10928 Harper Ave., Detroit 32, Mich., for use on heavy-duty trailers.

The steel-ribbed design is a radical departure from the usual tongue-and-groove type. Hardwood floor boards are bolted down between ten flanged steel ribs, running substantially the full length of the trailer. The flanges of the ribs support the floor boards, and the steel joints are flush with the top of the floor, thus forming a smooth long-wearing surface.

The ribs, which are of high-tensile steel, are welded to all chassis cross members and form an integral part of the airplane-type frame construction featured by Fruehauf. Since the steel ribs are stronger than any individual board, they not only strengthen the floor but give rigidity to the chassis by serving as transverse braces to the cross members.

Complete information regarding this new type of trailer flooring may be secured direct from the manufacturer by mentioning this item.

IMMEDIATE DELIVERY
UNIVERSAL Level-Transit
Telescope 12" long, 25 power—Horizontal Circle 4½" with vernier to 5 minutes—Vertical Arc 3"—Clamp and Tangent Screw for Vertical and Horizontal Limb—Instrument weighs 11 pounds, tripod 9 pounds.
Price complete with Tripod, Carrying Case, Sunshade, and Dust Cap $115.00. Can be furnished with a compass at $12.50 extra—Stadia Wires $5.00 extra.
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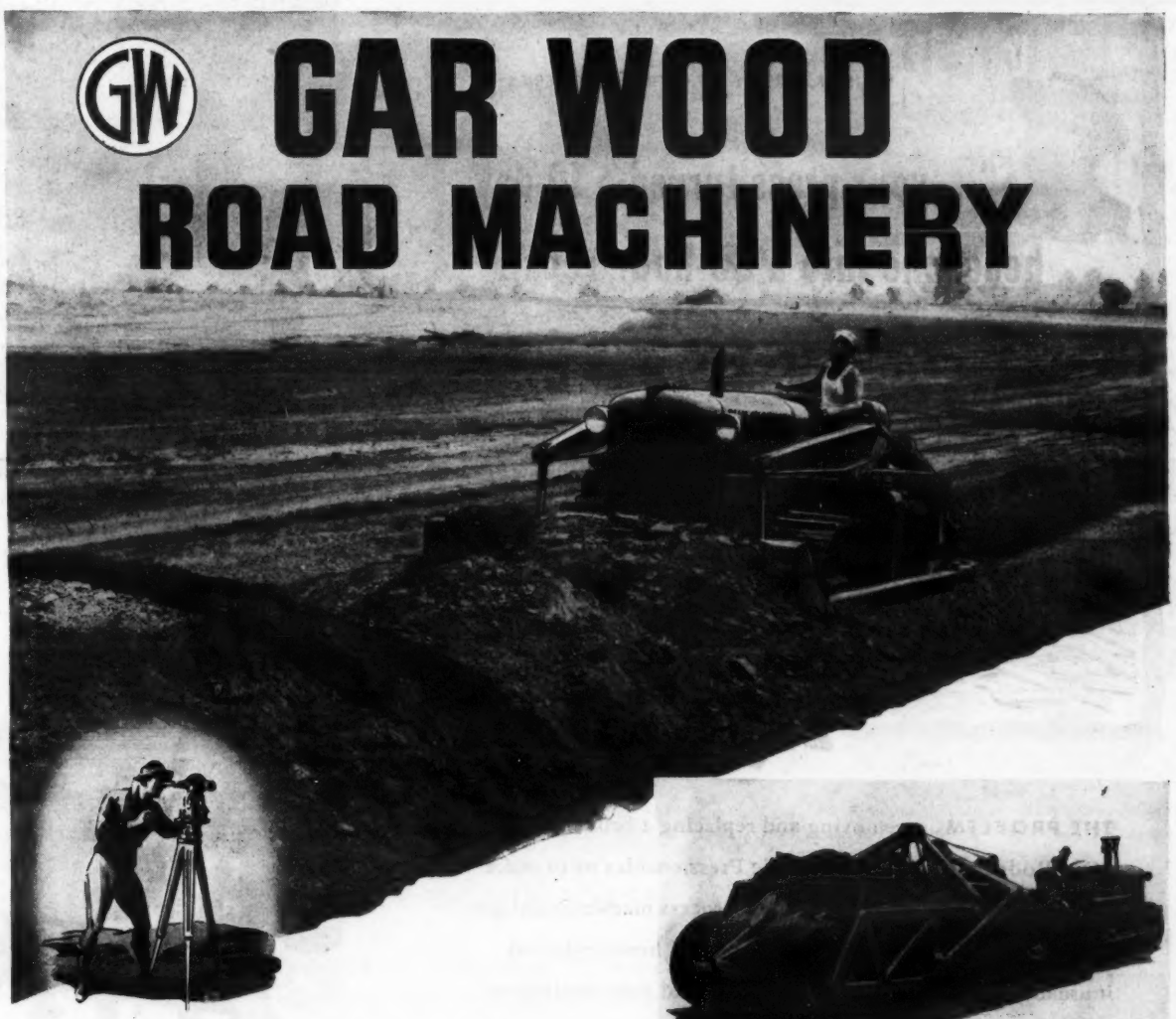

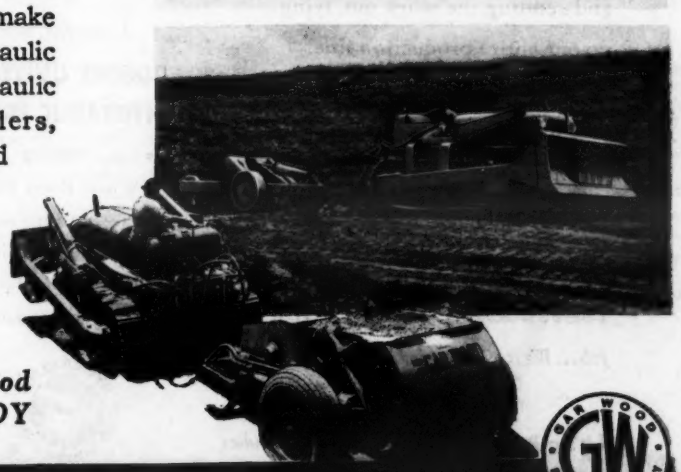

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GAR WOOD INDUSTRIES, Inc.
DETROIT 11 MICHIGAN

Pair of Pipe Siphons For Bridgeport Sewer

(*Continued from page 37*)

to the level of the first wale and then puddled. During excavation the trench was kept dry by a 2-inch Rex centrifugal pump and a 2-inch Trench & Marine Pump Co. centrifugal.

The reinforced-concrete siphon chamber has an inside diameter of 9 feet and an outside diameter of 12 feet. The same set of forms was used for the siphon chambers at both Yellow Mill Pond and at Johnson's Creek. The forms were built up of 4 x ¾-inch tongue-and-groove lumber with 2 x 12-inch lumber cut in segments to fit the curvature of the circumference. The segments were fastened together with two bolts at each end and the inside and outside forms spaced and tied by Richmond Tyscrus. Double 2 x 4's were used for the vertical wales both inside and outside to tie the forms. This single set of forms was picked up by the crane and set as one unit each time it was used.

Personnel

Both Contracts V and VIII for the cast-iron pipe siphons under Johnson's Creek and Yellow Mill Pond in Bridgeport, Conn., awarded to Spearin, Preston & Burrows of New York City, were directed by Howard Depew, Superintendent, with G. A. Neumann as Engineer for the contractor. The entire sewer-construction project was in charge of Henry L. Rowland, City Engineer, for the city of Bridgeport. C. R. Chisholm was Resident Engineer for the Federal Works Agency representing the Sub-Regional Office in Boston.

Madsen Issues New Asphalt Plant Catalog

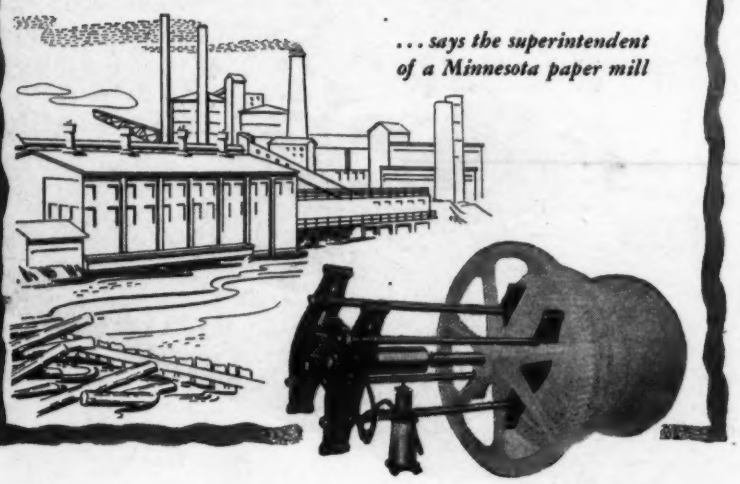
A 20-page catalog showing the mechanical features of its line of portable asphalt paving plants has just been issued by the Madsen Iron Works, Huntington Park, Calif. In addition to describing fully the new wartime developments of Madsen equipment and its component parts, and telling how it operates and what it can do, the catalog contains numerous photographs showing this equipment at work on recent construction jobs, as well as drawings and diagrams. Complete specifications of these plants, which are available in sizes from 500 to 6,000 pounds capacity, are also given in the catalog, as well as descriptions of auxiliary equipment.

Interested highway engineers and contractors can secure copies of Bulletin MP-120-83 direct from the manufacturer.

NO. 18 OF A "READY-WITH-A-RODGERS" SERIES

"...your press turned a 10-day headache into a 36-hour repair"

...says the superintendent of a Minnesota paper mill



THE PROBLEM... removing and replacing a broken drive gear. "Our Rodgers Universal Hydraulic Press enables us to make this repair on one of our continuous process machines and get it back into operation in something like 36 hours, whereas it usually took about 10 days before we had your equipment. It had meant burning off gears and sending the work out, tying up our entire production line. Your Rodgers has proved invaluable for this one purpose alone, although we wouldn't be without it for its uses on many other jobs."

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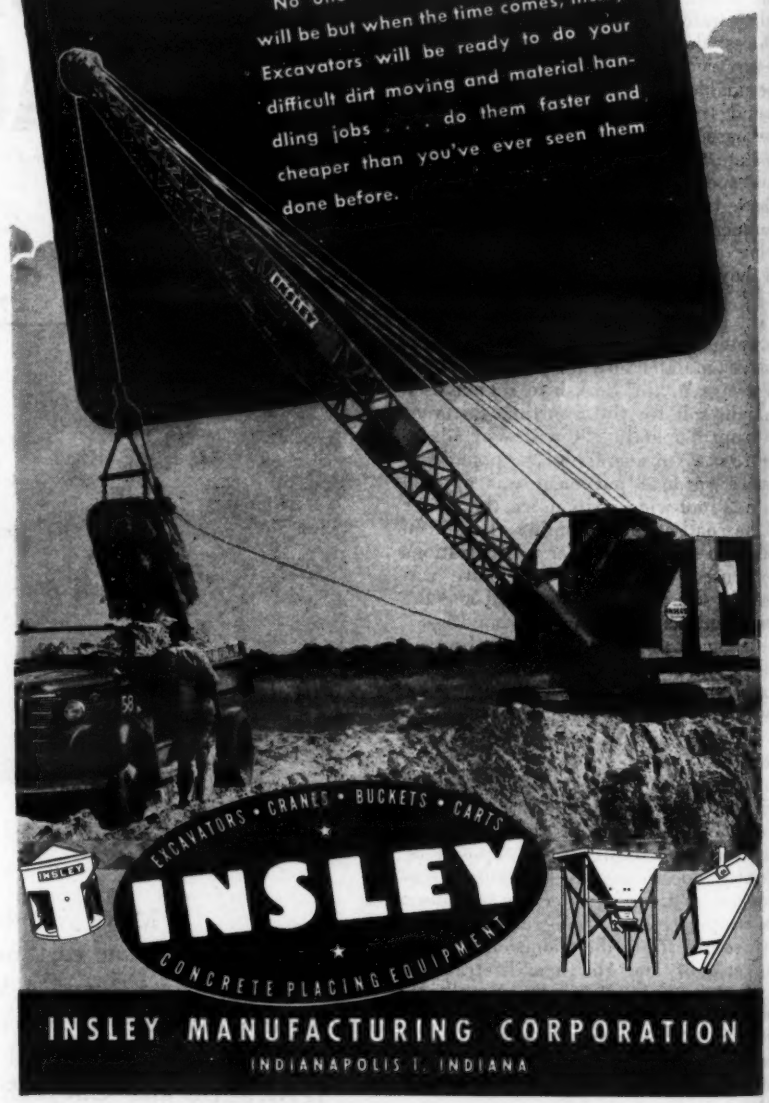
for your job . . . a better INSLEY IS ON THE WAY

When construction actually begins on the postwar plans that are on today's drawing boards, Insley Excavators will do their full share to help make these plans a reality.

No one can predict when this day will be but when the time comes, Insley Excavators will be ready to do your difficult dirt moving and material handling jobs . . . do them faster and cheaper than you've ever seen them done before.



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With Both $2.75
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Germination Ratio Decides Seed Price

In a bulletin revised February 25, 1944, the Landscape Division of the Virginia Department of Highways sets forth its grass-seed specifications in detail and gives an example of the method of payment. All seeds must be tested by the Virginia Department of Agriculture, whose decision is final. All seeds delivered under these specifications must be tested by or for the dealer in conformity with the specifications. Whenever official tests show that the seeds tested do not comply with the specifications, the Department reserves the right to reject the shipment and the dealer must replace it promptly.

At times when it is necessary to utilize a portion or all of the seed immediately, because of seasonal or other conditions or before the final test reports are received from the Department of Agriculture, the Highway Department reserves the right to use the seed with the understanding that an adjustment proportionate to any deficiency in pure live seed will be made on the purchase price. The amount to be paid is determined by a formula in which the ratio of the per cent of live seed by test to the per cent of live seed by specifications is used as the factor to multiply the total price to arrive at the payment price. For example: domestic rye grass testing 80 per cent pure live seed, where the specifications call for 89 per cent pure live seed, would be paid for at 80/89 of the purchase price. If the purchase price was $200 (1,000 lbs at 20c per pound), then the payment would be 80/89 of $200 or $179.78.

The accompanying table shows Virginia's grass-seed specifications.

Virginia Grass-Seed Specifications

KIND OF SEED	PERCENTAGE OF PURE SEED X GERMINATION		PER CENT PURE LIVE SEED	WEED SEED** (Not Over)
Domestic rye grass	99.00 × 90.00	=	89	0.50
Red top	95.00 × 90.00	=	86	1.00
Orchard grass	90.00 × 80.00	=	72	1.00
White Dutch clover*	97.00 × 80.00	=	78	0.75
Timothy	99.00 × 90.00	=	89	0.25
Kentucky blue grass	95.00 × 85.00	=	81	0.80
Bermuda grass	95.00 × 83.00	=	79	0.25
Korean lespedeza	98.00 × 83.00	=	81	1.00
Sericea lespedeza	97.00 × 80.00	=	78	0.60
Sheep fescue	92.00 × 80.00	=	74	1.50
Chewings fescue	99.00 × 75.00	=	74	0.50
Red clover***	98.50 × 87.00	=	86	0.50
Red fescue	95.00 × 80.00	=	76	0.50

* "Hard Seed" will be given consideration in checking germination of white clover.
** No noxious weed seed, as defined by the Virginia Agricultural Seed Law, Section 2(d), will be permitted.
*** Red clover must be Virginia grown.

Sappenfield to Sell Southern Mills Output

N. D. Sappenfield, formerly hardwood manager for The Dwight Hinckley Lumber Co., Cincinnati, Ohio, has become Manager of the Montgomery, Ala., office of the Germain Lumber Co., of Pittsburgh, Pa. In this new connection, he will have charge of the sales of the output of several southern lumber mills that are under exclusive contract, as well as a large production of other mills that have for many years looked to the Montgomery Office of Germain as an outlet for their lumber.

Working on the **Guadalcanal, Bougainville & Tokyo**

***. . . Where dependability really counts*—PIERCE GOVERNORS!**

● Railroading is rough and tough on the G. B. & T. Sturdy dependability in equipment is a most blessed—and most needed—characteristic. And there, on the army service force rail line in the South Pacific islands, gasoline-powered Plymouth locomotives are equipped with Pierce Governors.

Rugged, long-term, trouble-free dependability is built into Pierce Governors with the finest materials, by expert craftsmen, in the factory of the world's largest governor manufacturer. Maximum performance efficiency and protection of the engine is assured by the time-proven, mechanical, flyball principle. Wherever gas, gasoline or Diesel engines are used for industrial power, Pierce Governors are adding to their reputation for accuracy in control of engine speed—and long service with minimum trouble.

These are the reasons Pierce Governors are original equipment on many of the world's leading industrial engines. Specify Pierce on the new equipment you buy.

And if your present equipment is not Pierce-governed, write for the new Pierce Catalog.

THE PIERCE GOVERNOR COMPANY, INC.
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Manufacturers of Pierce Precision Governors and Sisson Automatic Chokes

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PIERCE GOVERNORS

Quick-Acting . . . Interchangeable . . . Safe!

"AIR KING"
Universal Type
HOSE COUPLING

A quick-acting coupling with a reputation for efficiency and safety on all types of pneumatic tools. Locking heads are identical for all sizes of hose and threaded pipe ends, permitting coupling of any two sizes of hose, or hose to pipe, within the "Air King" size range, without adapters, bushings or extra fittings. Shanks of hose ends are long, amply corrugated and smoothly finished.

Threaded I.P.T. Female End

Threaded I.P.T. Male End

"Air King" Couplings are made in the following sizes: Hose Ends—⅜", ½", ⅝", ¾" and 1"; Pipe Ends—¼", ⅜", ½", ¾" and 1".

AUXILIARY LOCKING DEVICE

A special locking arrangement, for services of a hazardous nature or those involving excessive vibration, makes it impossible for the coupling to come apart until manually released.

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FOR VICTORY
BUY UNITED STATES WAR BONDS AND STAMPS

Fabrication of Steel For Bridges Simplified

(*Continued from page 59*)

and drawings of shop details for distribution to the various fabricators. A single fabricator was awarded a contract for preparation of material lists and shop details for all standard spans. Working in close cooperation with the designing engineers, this fabricator prepared detailed layouts of the various joints sufficient for making complete material lists. Meanwhile the work had been advertised on the basis of the design drawings and a few typical detailed drawings prepared by the design office to indicate the class of workmanship. Contracts were let to eight fabricating companies in the United States and Canada, in the area extending from the eastern seaboard to the middle west. The work was coordinated closely and, immediately after an award for fabrication, the material lists were furnished the fabricators' shops. Each fabricator reserved all suitable material in his own stock, and ordered the remainder from the mills.

During the time material was being rolled, work went ahead on the shop drawings. A separate and complete set was made for each span length, including an anchor-bolt setting plan, erection plans, and field rivet and bolt lists. These drawings were arranged so that each fabricator could add information about his part of the work. Space was left for entry of the name of the bridge, number of spans, color of shop paint and identifying paint mark, instructions regarding shipment, match-marking and temperature at which shop tapes were standardized. These drawings became the master set of detailed plans and reproductions were sent to each fabricator.

By the time the material was to be ordered, the requirements of each standard bridge crossing had been fairly well determined. The fabricators were furnished lists showing the bridge names, number of spans, identifying mark to be used, and all other necessary instructions for the additions to be made on the plans.

The sequence of shipment was set up for all spans and, insofar as possible, the steel, including the field rivets, was shipped by bridges, to avoid confusion at transfer and storage points.

As facts concerning the special bridges became available from the field, the type of structure and span lengths to be used were selected. Special bridges were required mainly across rivers of large size. Because of the difficulty of maintaining temporary crossings, construction of permanent bridges was of particular urgency.

Special Designs

The Peace River crossing between Dawson Creek and Fort Saint John required the first special bridge. (See C. & E. M., Sept., 1943, pg. 35). The main span is 930 feet, the side spans 465 feet, and the flanking approach deck truss spans 135 feet. Open-strand construction was adopted for the suspension cables and concrete for the floor.

The Liard River Bridge, the second special steel bridge on the program, is similar to the Peace River Bridge. The main span was made 543 feet long and the side spans 233 feet. It was built with a wood floor.

Unlike the two previous bridges, the Hyland River crossing permitted the use of falsework for the 600-foot deck structure. Such a structure had been designed and fabricated for the Rio Goascoran between Salvador and Honduras on the Inter-American Highway, and it was decided that a duplicate structure could be used with a considerable saving of time. The bridge is a three-span continuous deck truss with a curved bottom chord. The center span is 222 feet and the side spans 130 feet.

The next bridges to be planned were some 50 and 60-foot beam spans, 100-foot pony spans, and 250-foot through spans, all on a skew. The plans for these, in general, followed those for the standard spans. The 100 and 250-foot spans were skewed one panel, and for simplicity the trusses of the 250-foot skewed spans were made with parallel chords.

(*Concluded on next page*)

Public Roads Administration Photo

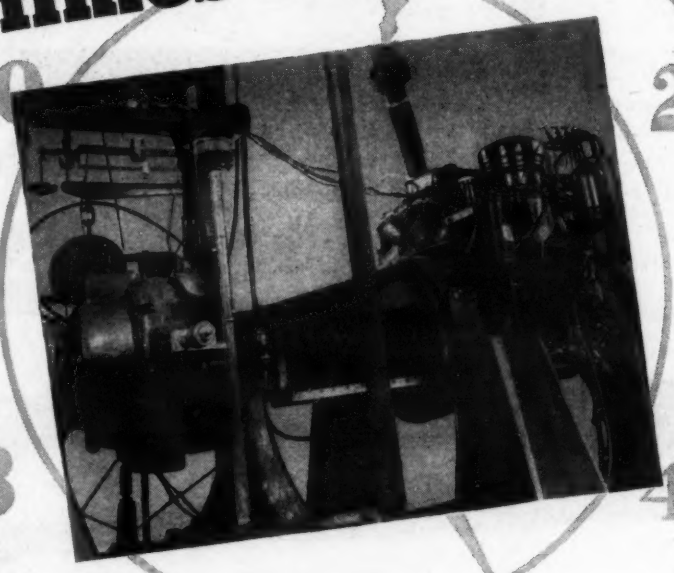
Another standardized bridge on the Alaska Highway. The Robertson River crossing consists of nine 200-foot deck trusses and three 50-foot I-beam spans.

Complete Line
of
DERRICKS
and
WINCHES

SAUGEN DERRICK CO.
3101 W. Grand Ave., Chicago 22, Ill.

41 times around the clock!

This 500-hour test (41 times around the clock) is described below.



Engine tests show Stanolube HD will reduce deposits and maintenance

A MOTOR OIL must pass many actual engine tests to meet the requirements of a truly heavy-duty oil. Most of these tests are far more severe than any service an oil will get in your equipment.

Some of these tests are described at the right. They are designed to duplicate, at a highly accelerated rate, all the destructive forces that tend to cause oil failures and resultant engine troubles.

Stanolube HD rates far above average in all these tests. No motor oil consistently rates as high as Stanolube HD in *all* qualities which a heavy-duty oil *must* have.

To find out what this means in reduced carbon, varnish, and engine deposits—fewer overhauls and lower maintenance—let a Standard Oil Automotive Engineer help put Stanolube HD to work in your fleet. Call your nearest local Standard Oil Company (Indiana) office, or write 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

Recognized tests of Heavy-Duty oil

1. **500-hour endurance test** in a high-speed, two-cycle Diesel engine. This test determines the ability of an oil to eliminate ring sticking, piston skirt deposits, port fouling, and bearing corrosion. This 500-hour test is equivalent to operating a truck under a *full load* for 30,000 miles.
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3. **Scratch test** in a Diesel engine measures the load carrying ability of an oil under run-in conditions.
4. **"Hot-Box" test** measures the protection an oil gives against bearing corrosion in Diesel engines under conditions most conducive to corrosion.
5. **36-hour accelerated stability and bearing corrosion test** evaluates these characteristics of an oil under severe overloads at high temperatures.

heat-proofed
Stanolube HD

Gasoline Powers the Attack . . . Don't Waste a Drop!

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ FLEET CONSERVATION SERVICE

Speedy Construction Of Alaska Hwy. Bridges

(*Continued from preceding page*)

A two-span continuous through truss was selected for the crossing of the Upper Liard River, 640 feet long and 50 feet deep over the center pier, sloping down to a depth of 35 feet at a distance of 120 feet from the pier.

The Tanana River Bridge is a cantilever through truss with a 430-foot main span and 258-foot anchor arms. The last of the special structures was the Teslin River Bridge, a high-level cantilever structure with a main span of 260 feet and anchor arms 220 feet long, with the truss depth 40 feet 6 inches at the main piers sloping to 30 feet at the anchor arms.

Personnel

Three structural engineers of the Public Roads Administration were responsible for the bridge design and erection. Raymond Archibald was in general charge of design and erection of the permanent bridges. A design office was established in New York City with William K. Greene in charge and John W. Guppy as his chief assistant. These two engineers were on leave of absence from the American Bridge Co. All the standard spans and the special superstructures referred to in this article were designed in this office and the close contact with the fabricators and their knowledge of the shop methods were the chief contributing factors in the successful construction of the bridges. Substructures and timber bridges were designed in the PRA offices at Edmonton, Fort St. John, and Whitehorse.

New Fleet-Welding Method Is Described in Booklet

An entirely new method for increasing the speed of welding mild steel is described in a 48-page booklet just issued by the Lincoln Electric Co., manufacturer of arc-welding equipment. How this latest Lincoln development, known as Fleet-Welding, introduces a technique of arc welding which not only greatly increases the speed of the process but also cuts costs as much as 59 per cent is discussed.

In addition to the booklet's twenty-nine photographs and drawings illustrating the Fleet-Welding technique, the bulletin carries procedure tables which list plate thickness, electrode size, current, melt-off rate, arc speed, number of passes, feet of joint welded per hour, and pounds of electrode per foot of weld.

In order to assist users of arc welding in establishing welding procedures and procedure control, the Lincoln Electric Co., Cleveland 1, Ohio, will be glad to send copies of this booklet on request. Just ask for Bulletin No. 440 and mention CONTRACTORS AND ENGINEERS MONTHLY.

New Tractor Shovel With Cable Control

A tractor shovel, in which there is 100 per cent cable control over the bucket for dumping and relatching to save time and reduce wear and tear on both the tractor and the truck being loaded, is made in ¾ to 2-yard capacities by M. P. McCaffrey, Inc., 2121 East 25th St., Los Angeles 11, Calif. By releasing a brake the operator can dump the load from any height and immediately return the bucket to loading position by engaging the power-unit clutch. Instead of dumping the bucket all at one time into the truck-bed when the dipper latch is tripped, the load can be spilled out under control.

The front-end construction of this tractor shovel is rigid, with a boxed channel replacing the tractor equalizer spring. The swing frame and tracks are extended, one track roller is added to each side, and the front idlers are built up. The bulk of the weight and the principal bracings are placed on the truck frames of the tractor. When digging, the rub-irons on the bucket butt on rollers attached to the rigid front frame, so there is little push against the side members.

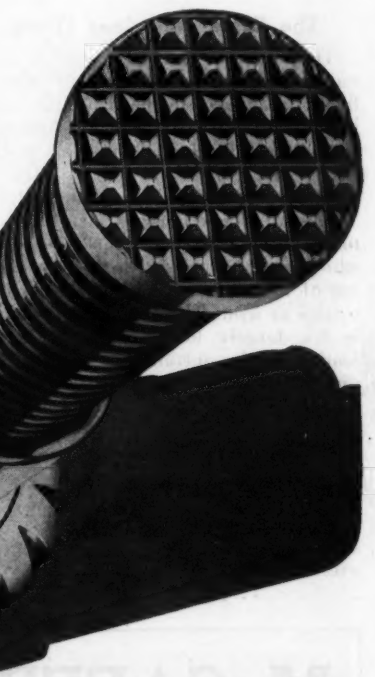
When the loader is equipped with a ripper, this attachment can be put into use in a few minutes by affixing the bar to the walking beam and to the ripper without the use of bolts or pins. A bulldozer attachment is optional equipment, and is mounted in a few minutes by inserting two trunnion pins and a bar connecting the 'dozer to the bucket.

The manufacturer states that this shovel is adaptable to all makes of tractors and will furnish specifications and literature on request to those mentioning this item.

So that's one of those bigger pay loads the crane man swears by!
HAISS Hi-Power Digging Buckets in one recent, competitive test showed 40% better efficiency than the next best—due largely to superior design of its closing gear. It pays to say "Haiss"
HAISS
DIGGING BUCKETS

GEORGE HAISS MANUFACTURING CO., INC., Canal Place & E. 142nd St., New York 51, N.Y.
Bucket agencies throughout the country Write, wire for prices, delivery or catalogs.

STILL GIVING YOU
Long LIFE AND
Sure LIFT!



To the Man Who Needs a Jack:

There are several *new* reasons why it pays to select a Blackhawk Jack today . . . or to wait for a Blackhawk's arrival, even though a less popular brand should happen to be available.

Here are the reasons:

With war limitations on certain critical materials, Blackhawk continues its great care in selecting the highest quality material available. And then, to make doubly sure that quality will be maintained . . . Blackhawk enforces even more rigid inspection of jacks than in peacetime.

Since a jack is valueless unless it continues to perform in every emergency . . . Blackhawk deliberately assumes increased manufacturing costs to assure a top quality product for you.

So—today, as in peacetime—when you need a jack—buy the best—buy Blackhawk—from your jobber.

A Product of BLACKHAWK MFG. CO., Dept. J1894, Milwaukee 1, Wis.

DEPENDABILITY tested proven PERFORMANCE

This seal is found ONLY on BLACKHAWK HYDRAULIC JACKS—your assurance of a wise and safe investment.

BLACKHAWK

5 Men

. . . or 1 man and a STERLING

Here's one way you can solve that manpower shortage problem — *utilize the load-carrying ability of Sterling Wheelbarrows.* It only takes one man and a Sterling to haul what otherwise would require five men. Sterlings offer dependable, low-cost, material transport service. They do not require skilled labor for successful operation. And they last a lifetime.

Sterlings are well-known for their balanced, easy wheeling qualities; sturdy steel tray, all welded (no rivets); smooth inside surface; top edge reinforced by continuous butt-welded rod; V-shaped tray braces.

If you need Sterlings today—write us. We cannot guarantee deliveries, but we'll do the best we can to take care of your requirements.

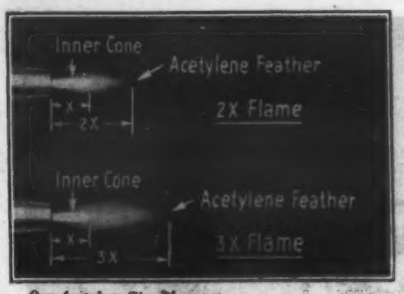
STERLING WHEELBARROW CO., MILWAUKEE, WIS.

Look for this Mark of STERLING Quality

Sterling WHEELBARROWS

☆ Buy A Share In America ☆

Lend a HELPING HAND with your WAR BONDS



Oxy-Acetylene Tips Photo
The amount of excess acetylene is expressed in terms of how many times longer the acetylene feather is than the inner cone of the flame, both measured from the blowpipe tip.

Flame Adjustment Vital in Welding

(*Continued from page 72*)

appearance of the neutral flame and the excess-oxygen flame, adjusting to the neutral flame should always be done by adjusting the blowpipe to give the three separate flame zones of the excess-acetylene flame. Then the excess of acetylene should be reduced by slowly closing the blowpipe acetylene valve until the secondary cone or feather just disappears. Exactly at this point, the flame is neutral.

The Excess-Acetylene Flame

The excess-acetylene flame is commonly referred to as a "carburizing" flame because the feather contains white-hot carbon particles, some of which may be dissolved by the molten metal and increase the carbon content in the immediate weld area. It is also called a "reducing" flame because of its tendency to remove the oxygen from iron oxides which may be present during the welding of iron or steel, and "reduce" these oxides to iron. This tendency, likewise, is due largely to the presence in the feather of the uncombined carbon. The excess-acetylene flame is used principally for Linde's steel-welding process, for the deposition of certain hard-facing materials, and for fusion-welding of aluminum, Monel, nickel, and some alloy steels.

The amount of extra acetylene in the excess-acetylene flame varies directly with the length of the intermediate cone or feather. The degree of excess is measured by the ratio of the length of the feather to the length of the inner cone, both being measured from the blowpipe tip. In other words, if the length of the inner cone of the neutral flame adjustment is called X, a 2X excess-acetylene flame adjustment would mean that the excess-acetylene feather is twice as long as the inner cone, 3X, three times as long, and so on.

The Excess-Oxygen Flame

The excess-oxygen flame is more frequently referred to as an "oxidizing" flame because of its oxidizing effect on the molten weld metal. The more extra oxygen that is supplied from the blowpipe, the greater is the oxidizing effect. A moderately oxidizing flame is used for all bronze-welding and bronze-surfacing, while a strongly oxidizing flame is used for fusion-welding certain brasses and bronzes. Sometimes the exact adjustment has to be determined by the action of the flame on the molten metal. When the flame will melt the base metal and maintain a shiny-surfaced puddle, it can be considered correctly adjusted.

When the flame is being adjusted to excess oxygen, the neutral adjustment should be made first and then the oxygen should be increased by opening the blowpipe oxygen valve (or closing the acetylene valve). The degree of excess of oxygen is measured by the amount the inner cone is shortened in length from the neutral adjustment. The more the inner cone is shortened from neutral, the greater the excess of oxygen in the flame.

"Slightly Excess" Flame Adjustment

For certain welding jobs, the operator sometimes is instructed to use a "slightly excess-acetylene" or "slightly excess-oxygen" flame. These terms may be found confusing, since everyone has a different idea of what "slightly" means. For this reason, it is necessary to understand why the flame adjustment is specified in this way.

In certain cases the characteristics of the metal being welded are such that even a slight excess of acetylene, for example, will have a harmful effect on the resulting weld. In these cases, a perfectly neutral flame would be entirely satisfactory. However, in order to avoid the possibility that any slight change in the oxygen or acetylene flow through the blowpipe will cause the flame to become slightly excess-acetylene, a slightly oxidizing flame is specified. In the same way, for those metals on which a slight excess of oxygen would be harmful, a slight excess of acetylene is specified.

During welding, the operator should check his flame adjustment frequently to be sure that it has not changed. Any fluctuation in the flow of gases may make it necessary to readjust the flame. Only a moment is required for the operator to lift the blowpipe, check the flame with his goggle-covered eyes, and

(*Concluded on next page*)

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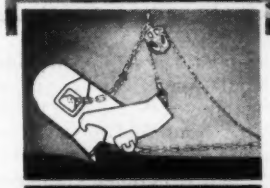

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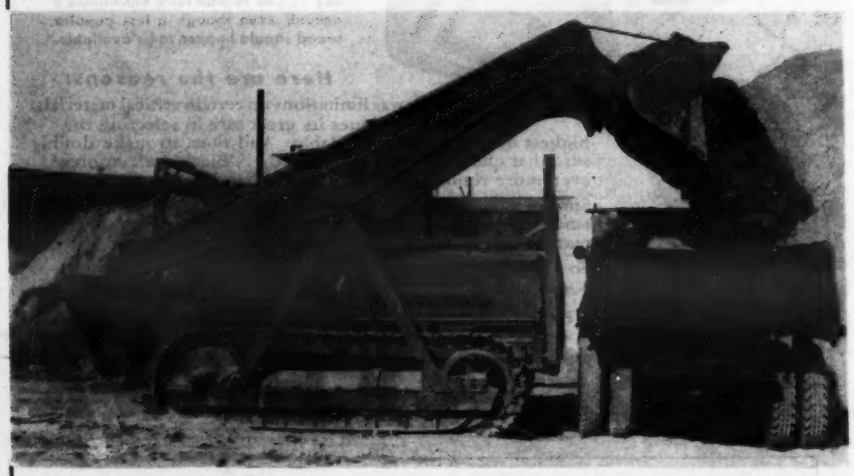

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Know Your Flames For Better Welding

(Continued from preceding page)

correct the adjustment if necessary.

Chemistry of Oxy-Acetylene Flame

The chemical reactions underlying the different flame adjustments are easy to understand. When acetylene is burned in air, without any oxygen from a cylinder, the oxygen in the air (about 21 per cent of the air by volume) combines with the two constituents of acetylene (carbon and hydrogen) to form carbon dioxide gas and water vapor. The nitrogen in the air (about 78 per cent by volume) is inert and does not enter into the reaction. It is, however, heated by the burning acetylene and, consequently, the temperature of the flame is lowered. In other words, the air-acetylene flame loses heat to the inert nitrogen. If pure oxygen from a cylinder is substituted for the nitrogen-diluted atmospheric oxygen by means of a blowpipe, this heat loss is eliminated and the flame temperature is greatly increased.

Combustion in Two Stages

In order to burn acetylene in a blowpipe, however, all of the oxygen required need not be supplied from a cylinder. Fortunately, from the standpoint of economy, part of the oxygen is supplied from the surrounding atmosphere. In fact, best results are obtained when a mixture composed of approximately one volume of cylinder oxygen and one volume of acetylene is burned at the blowpipe tip. For this reason, oxy-acetylene blowpipes are designed to mix oxygen and acetylene in approximately equal proportions. When this one-to-one mixture is lighted and the flame is adjusted to neutral, the combustion takes place in what are really two separate steps or stages.

In the first step, which takes place in the inner cone, the acetylene combines with cylinder oxygen to form carbon monoxide and hydrogen in which only the carbon element in the acetylene combines with oxygen; the hydrogen has been liberated but remains uncombined. In other words, combustion is incomplete. Both of the products of this reaction (carbon monoxide and hydrogen) are gases and both are combustible, that is, they will combine with oxygen. But in the inner cone there is no oxygen left for them to combine with, since the one-to-one mixture contains only enough oxygen (from the cylinder) to combine with the carbon in the acetylene. The two gases therefore pass from the inner cone to the outer envelope, where the second step takes place, completing the combustion.

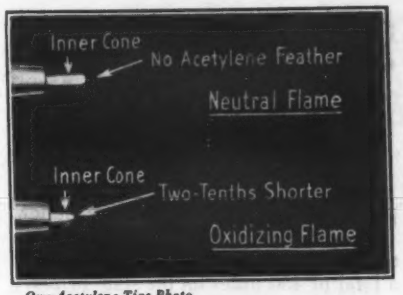
In the outer envelope, the carbon monoxide and the hydrogen each combine with oxygen from the atmosphere to form carbon dioxide and water vapor, respectively.

Excess-Acetylene

When, instead of the one-to-one mixture of the neutral flame discussed above, the flame is adjusted so that there is an excess-acetylene feather, complete combustion is accomplished in three stages instead of two. These stages can be easily visualized by referring to the sketch. In the inner cone, carbon combines with cylinder oxygen to form carbon monoxide, which, together with the liberated hydrogen, passes to the outer envelope in the same manner as in the neutral flame. But since there is an excess of acetylene, there is not enough oxygen supplied from the cylinder to oxidize all of the carbon into carbon monoxide. This excess carbon therefore also passes out of the inner cone toward the outer envelope, and it is the particles of this free carbon, at white-heat, that cause the characteristic feather or intermediate cone to become visible. At the outer edge of the feather the excess carbon combines with atmospheric oxygen to form carbon monoxide. This carbon monoxide and also the carbon monoxide that was formed in the inner cone pass to the outer envelope where they in turn combine with atmospheric oxygen to form carbon dioxide and complete the combustion.

The hydrogen liberated in the inner cone passes to the outer envelope and is oxidized by atmospheric oxygen into water vapor in the same manner as in the neutral flame.

This article and illustrations are reproduced through the courtesy of *Oxy-Acetylene Tips*.



Oxy-Acetylene Tips Photo

The amount of excess oxygen is measured in terms of how much shorter the inner cone is than the neutral inner cone.

Wickwire Spencer Buys Wire Co. in New Jersey

The Wickwire Spencer Steel Co., New York City, has announced the purchase of the business and assets of the Sirian Wire & Contact Co., of Newark, N, J. The steel company will immediately assume full control of all management and production operations, and has formed a new subsidiary company, the Wickwire Spencer Metallurgical Corp. Sirian's former name will be dropped.

The Sirian Wire & Contact Co. manufactures a line of fine drawn tungsten and molybdenum wire and rods and also various dies and tools of tungsten carbide. Its purchase is in line with Wickwire Spencer's policy of expansion to include operations for greater post-war markets and developments.

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Status of Planning For N. H. Road Work

(*Continued from page 2*)

program in our post-war construction.

Recent data made available through the Highway Planning Survey show that a total of 450 miles on the state primary system should be rebuilt, at an approximate cost of $24,000,000. About 10 per cent of this total may be considered to have resulted from deferred maintenance. Of this grand total, it is anticipated that 50 per cent could be built during the first three-year post-war period, provided sufficient Federal funds are made available to permit a program of this scope.

Interregional System

The proposed National Interregional Highway System crosses New Hampshire in two locations. In each, this system fulfills a definite highway need and its addition will make a vital contribution to the transportation facilities of this locality. One complete section of this Interregional System which crosses the state between Massachusetts and Maine along the line of U. S. Route 1 has been surveyed and, at the present time, plans covering its design are partially completed. This proposed project is about 15 miles in length, and the design incorporates all features of the modern express highway, with an entirely new freeway, fourteen highway grade separations, and divided traffic lanes. The estimated cost of this project is $3,000,000 and construction could be started within a short time, if sufficient funds were available.

Surveys for the construction on the other section of the Interregional System, which involves about 100 miles, have not been started. However, it is anticipated that upon resumption of construction activities sufficient personnel will be available to take up this work.

Status of Plans

While 75 per cent of the engineering personnel of the New Hampshire State Highway Department is now in the armed forces or connected with war industries, sufficient personnel has been retained to provide the necessary surveys and design for construction amounting to approximately $4,000,000. Field surveys and design prepared prior to the war contributed about half of this total. Field surveys are now in progress which will permit rapid expansion of this work.

Because of the man-power shortage, women have been used in the drafting room. Upon completion of the war-plant expansion program, there has been a marked tendency on the part of the older construction men previously connected with the Department to return to their old jobs. In most instances, these men have been placed on design or field surveys.

While, to date, no right-of-way has been acquired for the post-war construction program, areas of land involved on certain projects have been reviewed, with estimates made regarding their acquisition. Sufficient personnel has been retained by the Right-of-Way Department to guarantee the acquisition of land for construction purposes without delay. State laws provide a procedure which permits this phase of the work to be quickly expedited.

State funds available at the present time for design, right-of-way acquisition or construction amount to approximately $1,500,000.

A Small Lubricator For Air-Tool Lines

Small automatic lubricators in three sizes, varying from 4 to 10 inches in overall lengths and for pipe sizes from ¾-inch to 1-inch, for use in compressed-air lines serving air tools are completely described in a new bulletin issued by Rucker Equipment Co., 300 17th Street, Oakland 12, Calif.

These Arnold Lubricators are made of a Dural alloy with a tensile strength of 33,000 pounds; yet the smallest one weighs only 13 ounces and the largest only 65 ounces. They are cut into the air line and, being rounded at the corners, are easily dragged along the ground. The feed is adjustable from 0 to 0.03 inch and the capacity of the oil reservoir is from 1/6 pint to 1 pint. It can be filled while the line is under pressure.

The adjustable feeder insures a correct mixture of oiled air to the pneumatic tools, thus insuring proper tool lubrication, which cuts maintenance costs, increases production, and reduces the need for replacing expensive parts.

Complete information on the Arnold Oiled Air Automatic Lubricator may be secured direct from the manufacturer.

Two Promotions Made At Cleveland Tool Co.

Announcement has been made by the Cleveland Pneumatic Tool Co., Cleveland, Ohio, of the promotion of two veteran employees to top-ranking production posts. A. B. Johnson, who has been with the company twenty-eight years, has been named Plant Manager; and Conrad M. Wallin, who joined Cleveland Pneumatic in 1940 to assist in planning plant expansion, has been made Plant Manager of Cleveland Pneumatic Aerol, Inc., a wholly owned subsidiary.

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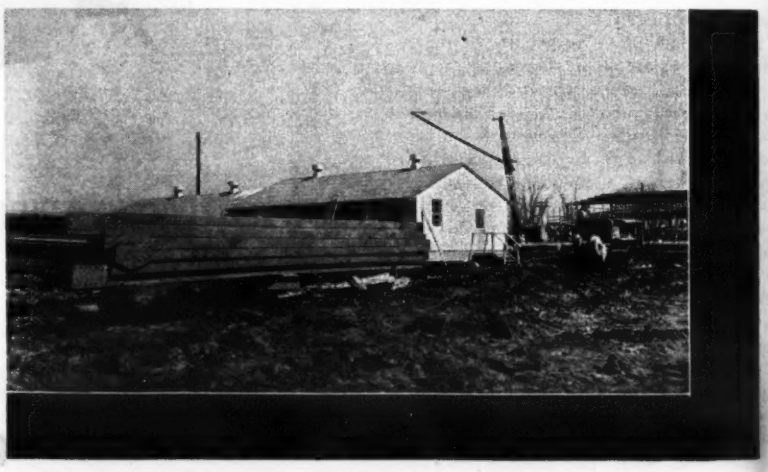

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The Twin Dipmaster tank for cleaning equipment parts.

Clean, Rinse Parts In New Double Tank

Two hot-liquid dip tanks in one portable unit feature the Twin Dipmaster developed by the Aeroil Burner Co., 5701 Park Ave., West New York, N. J., thus enabling the operator to remove dirt and grease from metal parts and products and rinse them without the need of carrying them to a second tank for the hot or cold rinsing. This portable electrically heated unit is supplied with coils for 110 or 220-volts ac.

Equipped with two insulated compartments separated by a partition that is also insulated, the Twin Dipmaster has two removable immersion-tube heating units, one for each tank, that deliver all the heat in the cleaning solution and rinse water. A separate automatic heat control for each compartment is supplied by two thermostats regulating any required temperature from 110 to 550 degrees F. and operating independently of one another. In addition, there are two built-in thermometers registering temperatures from 100 to 600 degrees F. and four dipping baskets to hold small parts.

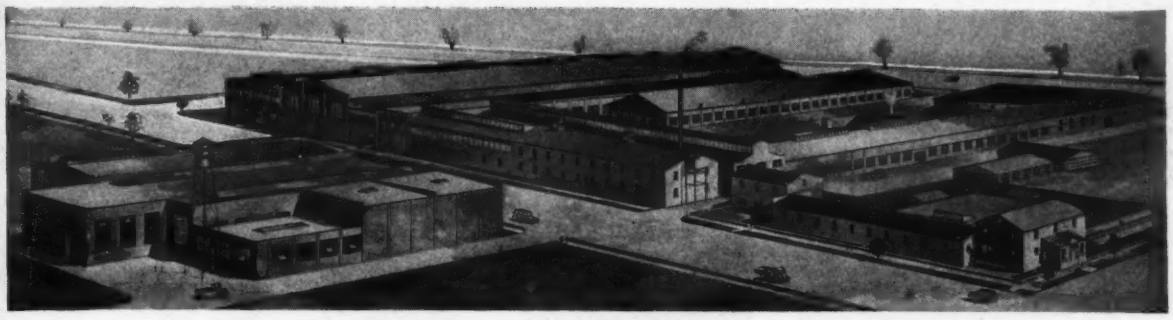
Completing the standard equipment are scum gutters, draw-off cocks, an insulated cover, pipe connections for the addition of fresh water to the rinse compartment as well as to drain off contaminated liquids, and two work grilles on which bulky parts can be rested during the cleaning and rinsing processes.

Complete information and prices of this portable tank for shop use may be secured direct from the manufacturer.

Hard-Facing Metals

A new folder on Coast Metals hard-facing welding rods and how to use them has recently been issued by Coast Metals, Inc., 1232 Camden Ave., S. W., Canton 6, Ohio. These rods are designed to aid in essential-equipment maintenance by providing a hard coating to the surfaces, edges and points of wear of equipment subjected to severe abrasion, impact or shock. This extends equipment life, results in fewer breakdowns, cuts down on idle labor, and conserves critical materials.

Copies of this folder on Coast Metals hard-facing may be obtained direct from the company.



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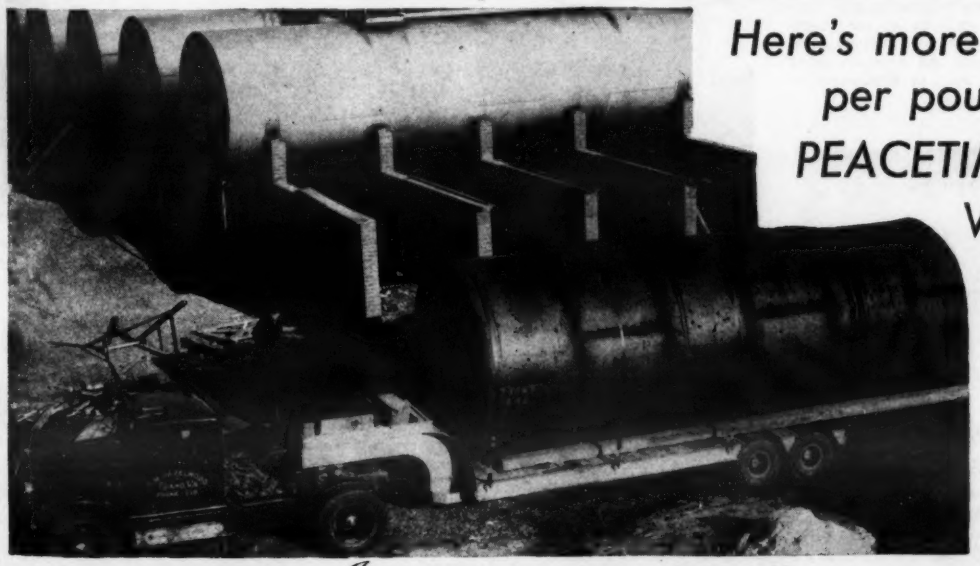

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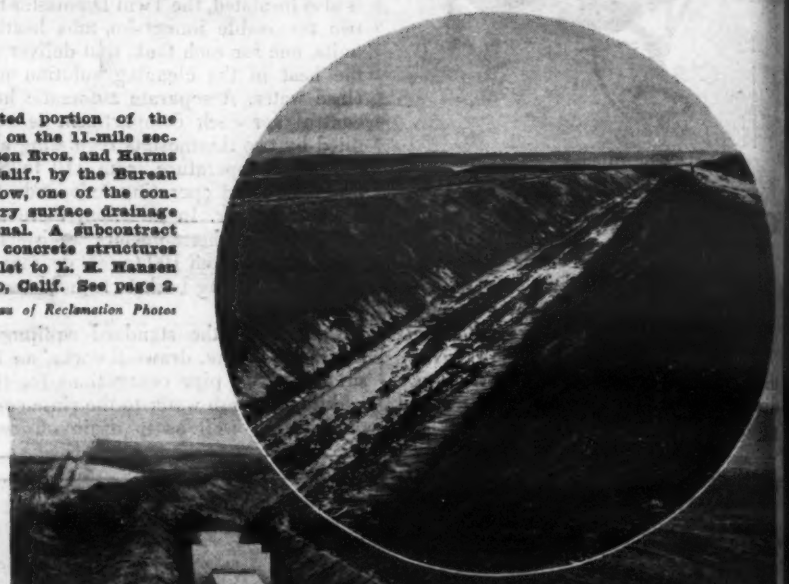

At right, a completed portion of the Madera Canal in cut on the 11-mile section awarded to Larsen Bros. and Harms Bros., Sacramento, Calif., by the Bureau of Reclamation. Below, one of the concrete culverts to carry surface drainage water under the Canal. A subcontract for the thirty-three concrete structures on this section was let to L. M. Hansen & Sons Co. of Fresno, Calif. See page 2.

Bureau of Reclamation Photos

The Johnson's Creek crossing of the new Bridgeport, Conn., sanitary and storm sewer project, showing the last of the lengths of pipe in the skids on the opposite shore, the crane with its pulling line to the sheave attached to a deadman, and, in the foreground, the 6-part line and block being detached from the traveling skid. See page 37.

A section of the 632-foot reinforced-concrete culvert with three barrels which crosses the extended east-west runway at the Newark, N. J., Airport. The enlargement of this field involved the construction of two culverts of this type and three eight-barrel culverts, as well as the installation of 10 miles of drainage pipe, and both bituminous and concrete paving. S. J. Groves & Sons of Bogota, N. J., and Johnson, Drake & Piper, Inc., of Minneapolis, Minn., and New York City, were the contractors. See page 1.

A scene in the Central Shops of the Montana State Highway Commission where all ma... repairs are made to the Commission's highway-maintenance equipment. See page ...

A central mixing plant used in the construction of an airfield in Britain. Cement was delivered in bulk and transported to the mixer by the conveyor at the right. Aggregates were elevated by the open conveyor at the left. The mixed concrete was taken to the job by lorry, or truck. At right, women and girls in the "Pick and Shovel Brigade" laying drainage pipe at an airfield in England. (British Combine Photo). See page 42.